SOIL SURVEY

Pulaski and Alexander Counties

ILLINOIS

UNITED STATES DEPARTMENT OF AGRICULTURE
Soil Conservation Service
In cooperation with
ILLINOIS AGRICULTURAL EXPERIMENT STATION

Issued July 1968

Major fieldwork for this soil survey was done in the period 1957–63. Soil names and descriptions were approved in 1964. Unless otherwise indicated, statements in the publication refer to conditions in the county in 1965. This survey was made cooperatively by the Soil Conservation Service and the Illinois Agricultural Experiment Station, as part of the technical assistance furnished to the Pulaski-Alexander Soil and Water Conservation District.

Illinois Agricultural Experiment Station Soil Report No. 85.

HOW TO USE THIS SOIL SURVEY

THIS SOIL SURVEY of Pulaski and Alexander Counties contains information that can be applied in managing farms and woodlands; in selecting sites for roads, ponds, buildings, or other structures; and in appraising the value of tracts of land for agriculture, industry, or recreation.

Locating Soils

All of the soils of Pulaski and Alexander Counties are shown on the detailed map at the back of this survey. This map consists of many sheets that are made from aerial photographs. Each sheet is numbered to correspond with numbers shown on the Index to Map Sheets.

On each sheet of the detailed map, soil areas are outlined and are identified by symbol. All areas marked with the same symbol are the same kind of soil. The soil symbol is inside the area if there is enough room; otherwise, it is outside and a pointer shows where the symbol belongs.

Finding and Using Information

The Guide to Mapping Units can be used to find information in the survey. This guide lists all of the soils of the two counties in numerical order by map symbol. It shows the page where each kind of soil is described, and also the page for the management group, the fruit and vegetable group, and the other groups in which the soil has been placed.

Individual colored maps showing the relative suitability or limitations of soils for many specific purposes can be developed by using the soil map and information in the text. Interpretations not included in the text can be developed by grouping the soils according to their suitability or limitations for a particular use. Translucent material can be used as an overlay over the soil map and colored to show soils that have the same limitation or suitability. For example, soils that have a slight limitation for a given use can be colored green, those with a moderate limitation can be colored yellow, and those with a severe limitation can be colored red.

Farmers and those who work with farmers can learn about use and management of the soils in the soil descriptions and in the discussions of the interpretative groupings.

Foresters and others can refer to the subsection "Use of the Soils for Woodland," where the soils are grouped according to their suitability for trees.

Game managers, sportsmen, and others concerned with wildlife will find information about soils and wildlife in the subsection "Use of the Soils for Wildlife."

Community planners and others interested in recreation developments can read about the soil properties that affect the choice of sites for parks and recreation areas in the subsection "Use of the Soils for Recreation."

Engineers and builders will find under "Use of the Soils for Engineering" tables that give engineering descriptions of the soils in the area and that name soil features that affect engineering practices and structures.

Scientists and others can read about how the soils were formed and how they are classified in the section "Formation, Morphology, and Classification of Soils."

Students, teachers, and others will find information about soils and their management in various parts of the text.

Newcomers in Pulaski and Alexander Counties may be especially interested in the section "General Soil Map," where broad patterns of soils are described. They may also be interested in the section "General Nature of the Counties," which gives additional information about the two counties.

Cover picture: **Courtesy of Mr. Henry Moreland, Cairo, Ill. Aerial view of Alexander and Pulaski Counties at confluence of the Ohio River (right) and the Mississippi River (left). The large cultivated area on the point between the rivers is dominantly Tice silty clay loam, with small areas of Gorham and Riley soils nearer the riverbanks. The city of Cairo (middle ground) is mainly on Tice silty clay loam. The wooded areas in background consist of Tice silty clay loam, Darwin silty clay, and Karnak silty clay.**

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NOTICE TO LIBRARIANS

Series year and series number are no longer shown on soil surveys. See explanation on the next page.

Issued July 1968

EXPLANATION

Series Year and Series Number

Series year and number were dropped from all soil surveys sent to the printer after December 31, 1965. Many surveys, however, were then at such advanced stage of printing that it was not feasible to remove series year and number. Consequently, the last issues bearing series year and number will be as follows:

Series 1957, No. 23, Las Vegas and Eldorado Valleys Area, Nev.
Series 1958, No. 34, Grand Traverse County, Mich.
Series 1959, No. 42, Judith Basin Area, Mont.
Series 1960, No. 31, Elbert County, Colo. (Eastern Part)
Series 1961, No. 42, Camden County, N.J.
Series 1962, No. 13, Chicot County, Ark.
Series 1963, No. 1, Tippah County, Miss.

Series numbers will be consecutive in each series year, up to and including the numbers shown in the foregoing list. The soil survey for Tippah County, Miss., will be the last to have a series year and series number.

SOIL SURVEY OF PULASKI AND ALEXANDER COUNTIES, ILLINOIS

BY WALTER D. PARKS, SOIL CONSERVATION SERVICE, AND J. B. FEHRENBACHER, UNIVERSITY OF ILLINOIS

FIELDWORK BY WALTER D. PARKS, IN CHARGE, C. C. MILES, J. M. PADEN, AND B. J. WEISS,[1] SOIL CONSERVATION SERVICE

UNITED STATES DEPARTMENT OF AGRICULTURE, SOIL CONSERVATION SERVICE, IN COOPERATION WITH ILLINOIS AGRICULTURAL EXPERIMENT STATION

PULASKI AND ALEXANDER COUNTIES are at the southern tip of Illinois, at the confluence of the Mississippi and Ohio Rivers (fig. 1). The Ohio River forms the southeastern boundary of Pulaski County, and the Mississippi forms the western and southern boundaries of Alexander County. The boundary between the two counties is formed by Mill Creek and the Cache River. Mound City is the county seat in Pulaski County. Cairo, the county seat in Alexander County, is the largest city in both counties. Although the two counties are separate political entities and differ considerably in topography and resources, they are closely associated in several fields, particularly agriculture and recreation.

Farming is the leading occupation in the area and, in combination with forestry, contributes a major part of the total income. Corn, soybeans, hogs, and beef cattle are the leading farm products. The Horseshoe Lake Conservation Area in Alexander County brings a sizable revenue to the county during the goose and duck hunting season. The silica mining industry of Alexander County provides off-season employment to local people.

Alexander County has an area of 248 square miles, and Pulaski County has an area of 204 square miles. Slightly more than half of the combined acreage consists of bottom land and low terraces along the Cache, Ohio, and Mississippi Rivers. These areas are used mainly for the production of corn, soybeans, and wheat. Cotton is a minor crop but is mentioned because it is the only cotton produced in Illinois.

The distinctly steep and rocky uplands of Alexander County are used principally for woodland. Only small areas are used for pasture or crops. The more rolling uplands of Pulaski County are better suited to farming. About half of this acreage is used for pasture. The rest is in cultivated crops and woodland.

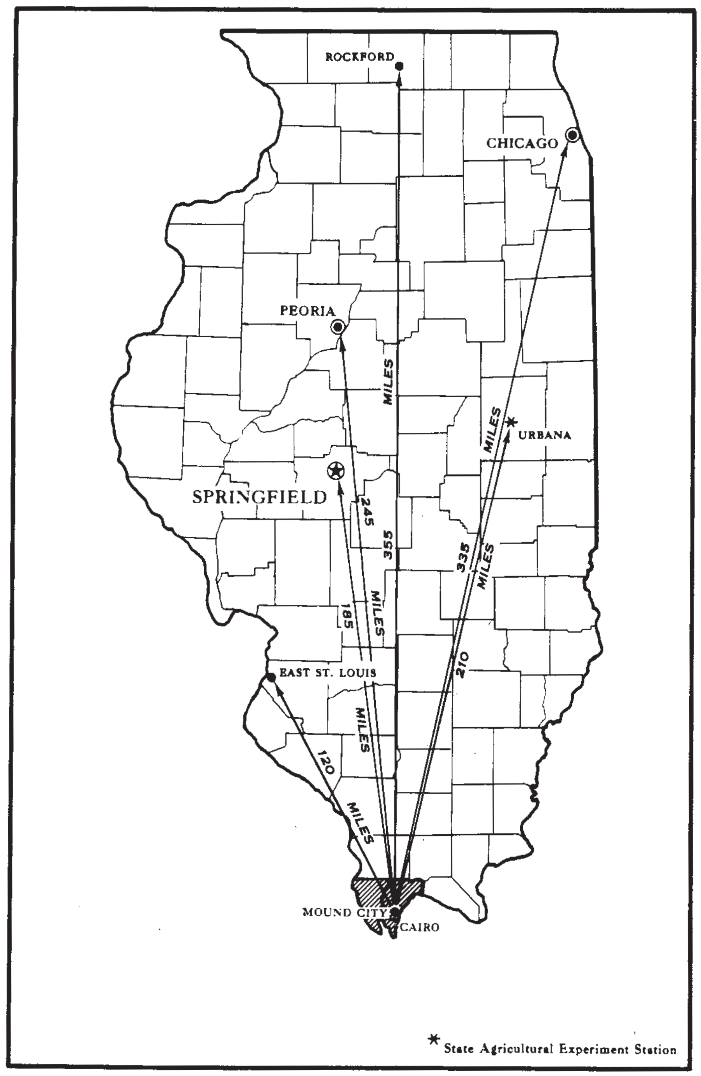

Figure 1.—**Location of Pulaski and Alexander Counties in Illinois.**

[1] Others who contributed to the fieldwork include F. L. Awalt, R. E. Bourland, F. N. Gebeck, E. G. Holhubner, W. D. Nettleton, R. Rehner, L. M. Reinebach, and R. F. Wicks.

How This Survey Was Made

Soil scientists made this survey to learn what kinds of soil are in Pulaski and Alexander Counties, where they are located, and how they can be used. They went into the county knowing they likely would find many soils they had already seen, and perhaps some they had not. As they traveled over the county, they observed steepness, length, and shape of slopes; size and speed of streams; kinds of native plants or crops; kinds of rock; and many facts about the soils. They dug or bored many holes to expose soil profiles. A profile is the sequence of natural layers, or horizons, in a soil; it extends from the surface down to the rock material that has not been changed much by leaching or by roots of plants.

The soil scientists made comparisons among the profiles they studied, and they compared these profiles with those in counties nearby and in places more distant. They classified and named the soils according to uniform procedures. To use this report efficiently, it is necessary to know the kinds of groupings most used in a local soil classification.

Soils that have profiles almost alike make up a soil series. Except for different texture in the surface layer, all the soils of one series have major horizons that are similar in thickness, arrangement, and other important characteristics. Each soil series is named for a town or other geographic feature near the place where a soil of that series was first described and mapped. Hosmer and Wheeling, for example, are the names of two soil series. All the soils in the United States having the same series name are essentially alike in those characteristics that affect their behavior in the natural, undisturbed landscape. Soils of one series can differ somewhat in texture of the surface soil and in slope, stoniness, or some other characteristic that affects use of the soils by man.

Many soil series contain soils that are alike except for texture of their surface layer. According to such differences in texture, separations called soil types are made. Within a series, all the soils having a surface layer of the same texture belong to one soil type. Darwin silty clay and Darwin silty clay loam are two soil types in the Darwin series. The difference in texture of their surface layer is apparent from their names.

Some soil types vary so much in slope, degree of erosion, number and size of stones, or some other feature affecting their use, that practical suggestions about their management could not be made if they were shown on the soil map as one unit. In Pulaski and Alexander Counties, soil types are divided into phases primarily on the basis of differences in slope or degree of erosion because these differences affect management. For example, Hosmer silt loam, 2 to 4 percent slopes, is one of several phases of Hosmer silt loam, a soil type that ranges from gently sloping to steep.

After a guide for classifying and naming the soils had been worked out, the soil scientists drew the boundaries of the individual soils on aerial photographs. These photos showed woodlands, buildings, held borders, trees, and other details that greatly help in drawing boundaries accurately. The soil map in the back of this survey was prepared from the aerial photographs.

The areas shown on a soil map are called mapping units. On most maps detailed enough to be useful in planning management of farms and fields, a mapping unit is nearly equivalent to a soil type or a phase of a soil type. It is not exactly equivalent, because it is not practical to show on such a map all the small, scattered bits of soil of some other kind that have been seen within an area that is dominantly of a recognized soil type or soil phase.

In preparing some detailed maps, the soil scientists have a problem of delineating areas where different kinds of soils are so intricately mixed, or occur in such small individual tracts that it is not practical to show them separately on the map. Therefore, such an area is shown as one mapping unit and is called a soil complex. Ordinarily, a soil complex is named for the major kinds of soil in it. For example, the Stookey-Bodine complex in Pulaski and Alexander Counties consists mainly of Stookey silt loam and Bodine cherty silt loam. Another kind of mapping unit is the undifferentiated group, which consists of two or more soils that may occur together without regularity in pattern or relative proportion. The individual tracts of the component soils could be shown separately on the map, but the differences between the soils are so slight that the separation is not important for the objectives of the soil survey. An example is Cape and Karnak silty clay loams.

Most surveys include areas where the soil material is so rocky, so shallow, or so frequently worked by wind and water that it cannot be classified by soil series. These areas are shown on a soil map like other mapping units, but they are given descriptive names, such as Alluvial land, and are called land types. In this survey, spot symbols are used to designate small areas of wet soils or outcrops of rock.

While a soil survey is in progress, samples of soils are taken, as needed, for laboratory measurements and for engineering tests. Laboratory data from the same kinds of soils in other places are assembled. Data on yields of crops under defined practices are assembled from farm records and from field or plot experiments on the same kinds of soils. Yields under defined management are estimated for all the soils.

But only part of a soil survey is done when the soils have been named, described, and delineated on the map, and the laboratory data and yield data have been assembled. The mass of detailed information then needs to be organized in such a way as to be readily useful to different groups of readers, among them farmers, managers of woodland, engineers, and homeowners. Grouping soils that are similar in suitability for each specified use is the method of organization commonly used in a survey. On the basis of yield and practice tables and other data, the soil scientists set up trial groups. They test these groups by further study and by consultation with farmers, agronomists, engineers, and others, then they adjust the groups according to the results of their studies and consultation. Thus, the groups that are finally evolved reflect up-to-date knowledge of the soils and their behavior under present methods of use and management.

General Soil Map

The general soil map at the back of this survey shows, in color, the soil associations in Pulaski and Alexander Counties. A soil association is a landscape that has a distinctive proportional pattern of soils. It normally consists of two or more major soils and at least one minor soil, and it is

named for the major soils. The soils in one association may occur in another, but in a different pattern.

A map showing soil associations is useful to people who want a general idea of the soils in a county, who want to compare different parts of a county, or who want to know the location of large tracts that are suitable for a certain kind of farming or other land use. Such a map is not suitable for planning the management of a farm or field, because the soils in any one association ordinarily differ in slope, depth, stoniness, drainage, and other characteristics that affect management.

Described in the pages following and shown on the colored map at the back of this survey are the 11 soil associations in Pulaski and Alexander Counties.

1. Hosmer-Alford association

Moderately deep, slowly permeable soils with a fragipan, and deep, moderately permeable soils; rolling to steep

This association is characterized by rolling to steep hills. The land near Olmsted is steep or very steep, and that between Olmsted and Villa Ridge is rolling to steep. Elsewhere the slope varies; some areas are gently rolling to strongly rolling, with only a few steep slopes. This association occupies about 14 percent of the two counties and includes most of the uplands in Pulaski County. The soils formed in thick loess that overlies Coastal Plain gravel. The gravel is exposed in only a few places.

Hosmer silt loam makes up about 65 percent of this association, and Alford silt loam, about 20 percent. The Hosmer soil has a fragipan (compact layer) and is slowly permeable. The Alford soil is deep and moderately permeable. It occurs in an erratic pattern, mainly on ridges, and in many places is on the upper slopes, above the Hosmer soils. In some areas the Alford soil is underlain by Coastal Plain gravel at a depth of 20 to 40 inches.

Minor soils make up about 15 percent of this association. On the very steep slopes near Olmsted are areas of Stookey and Bodine soils. On bottom lands throughout the association are small and medium-sized areas of the moderately well drained Sharon soils, the somewhat poorly drained Belknap soils, and the poorly drained Bonnie soils. On the bottom lands adjacent to the Ohio River are small areas of the well-drained Allison soils.

This association is used principally for permanent pasture (fig. 2). Cultivated crops are grown mainly on the bottom lands and the gently sloping ridgetops. Some strong slopes are also cultivated, but this acreage is gradually being reduced. Many of the steep slopes, generally areas no more than 40 acres in size, are wooded, and there are a few large wooded areas, mainly near the Ohio River. The principal cultivated crops are corn, soybeans, and wheat. A considerable acreage is in rotation pasture. Erosion is the major hazard.

2. Alford-Hosmer association

Deep, moderately permeable soils, and moderately deep, slowly permeable soils with a fragipan; rolling to steep

This association consists mainly of rounded, rolling to steep hills and many small knoblike hills that are isolated by areas of bottom land. It makes up about 4 percent of the two-county area but occurs only in Pulaski County, north and south of the Cache River.

***Figure 2.*—Pond beside an area of Hosmer silt loam, 4 to 7 percent slopes, eroded. Such ponds are essential for livestock water in pastures in the Hosmer-Alford soil association.**

The Alford soils make up about 65 percent of this association, and the Hosmer soils about 20 percent. The Alford soils are well drained and moderately permeable. The Hosmer soils occupy areas around the upper part of some drainageways or are on the lower part of slopes. They have a fragipan and are slowly permeable.

Minor soils make up about 15 percent of this association. These are the moderately well drained Sharon soils, the somewhat poorly drained Belknap soils, and the poorly drained Bonnie soils, all of which occur as small to medium-sized areas on bottom lands.

The uplands in this association are used mainly for pasture. Cultivated crops, including corn, soybeans, and wheat, are grown on many of the ridgetops and side slopes and on the bottom lands. About 20 percent of the acreage is wooded.

Erosion is the principal hazard in growing cultivated crops. Farms have a more prosperous appearance than in the other associations, and there is less idle and abandoned land.

3. Alford-Stookey-Muren association

Deep, moderately permeable soils; rolling to steep

This association is characterized by moderately sloping to strongly sloping ridgetops and steep side slopes. It makes up about 7 percent of the two counties and occurs principally north and west of Mounds in Pulaski County and in the vicinity of Thebes in Alexander County. A gently to strongly rolling area is west of Olive Branch. In most places the soils formed in loess that is between 20 and 30 feet thick over Coastal Plain gravel. In other places the loess is underlain by chert bedrock. The ridgetops, which are from 100 to 400 feet in width, commonly are cultivated.

The Alford soils make up about 70 percent of this association, the Stookey soils 16 percent, and the Muren soils 8 percent. The Alford and the Stookey soils are well drained and moderately permeable. The Muren soils are moderately well drained and moderately permeable. The Alford and Muren soils are on the ridges and many of the side slopes. The Muren are mainly along ridgetop drainageways. The Stookey soils are on many of the steep and very steep slopes near Thebes.

The remaining 6 percent of this association consists of minor soils in small areas on uplands and on bottom lands

along streams. On the bottom lands are the somewhat poorly drained, slightly acid Wakeland soils; the moderately well drained Haymond soils; and the poorly drained Birds soils.

The ridgetops are used about equally for cultivated crops and for permanent pasture. Generally, the strongly sloping hillsides are pastured, and the steep hillsides are wooded. Many of the moderately steep hillsides that were once used for pasture or crops are now idle or are reverting to brush and woods. With proper management, the soils in these areas will produce good pasture. Crop fields are confined to ridges and bottom lands, and thus most are narrow and small. Wooded areas are large. Pastures vary in size.

Erosion is the major hazard if the soils of this association are used for crops. If the full potential of these fairly productive soils is to be realized, measures need to be taken to maintain fertility and to improve the management of pastures and woodland.

4. Stookey-Bodine association

Deep, permeable, generally weakly developed soils, and shallow, cherty soils; steep and very steep

The topography of this association is distinctive. The elevations vary as much as 300 feet within a horizontal distance of 600 feet. Slopes are steep or very steep; ridgetops are long and generally extremely narrow; and the drainage pattern is intricate, highly developed, and deeply incised. The rugged hills are capped by a mantle of loess that ranges from 20 to 30 feet or more in thickness and generally overlies massive beds of chert. On many of the hillsides, the chert is exposed. Near Fayville, the loess is underlain by Coastal Plain gravel. In a few small local areas, it is underlain by limestone, sandstone, or shale, but this material has had no influence on the soil properties. This association makes up about 12 percent of the total acreage of the two-county area. It covers all of the uplands of Alexander County, except for some small areas of the Alford-Stookey-Muren soil association, but it occupies only a small area west of Wetaug in Pulaski County.

About 34 percent of this association consists of Stookey and Bodine soils that are mapped as a complex. Stookey soils that are mapped separately make up about 32 percent, and Bodine soils about 4 percent. The deep, well-drained Stookey soils are on steep slopes. The shallow, somewhat excessively drained Bodine soils are on steep and very steep slopes.

Minor soils make up about 30 percent of this association. The well drained Alford soils occur mostly on the narrow ridges, but they are also associated with the moderately well drained Muren soils on some of the slightly wider ridges. The moderately well drained Hosmer soils, which contain a fragipan, are on foot slopes or valley slopes along the north and west sides of many valleys. Small to medium-sized areas of bottom lands along creeks are occupied mainly by the well-drained Haymond soils, the somewhat poorly drained Wakeland soils, and the poorly drained Birds soils. The well drained or moderately well drained Elsah soils, which are cherty, are also on bottom lands.

The bottom lands and foot slopes are used mainly for crops and pasture. A few ridges are wide enough to be used for crops, but most ridges are too narrow or are not readily accessible. Hillsides are used occasionally for pasture. Most of the acreage is wooded (fig. 3). About two-thirds of the acreage in this association is in the Shawnee National Forest. Timber is the principal product. Steepness and stoniness are the major limitations in the use of the soils for crops or pasture. Erosion needs to be controlled if the sloping soils are used for crops or pasture, and flash floods are a hazard on bottom lands.

Figure 3.—**Typical view of the Stookey-Bodine soil association.**

5. Hosmer-Stoy association

Deep, slowly permeable soils, and moderately deep, slowly permeable soils with a fragipan; level to strongly sloping

This association is characterized by rather broad, level to gently sloping areas and by more strongly sloping areas along drainageways. It occupies uplands that are at an elevation of less than 400 feet. One area is south of New Grand Chain, and another is between Mounds and Olmsted. These areas make up about 4 percent of the acreage of the two counties. In the vicinity of Mounds and Olmsted, the slopes along drainageways are quite short and are moderately sloping, whereas in the vicinity of New Grand Chain, the slopes are steeper because drainageways are deeper. The soils formed in a thick mantle of loess over Coastal Plain gravel.

The Hosmer soils make up about 40 percent of this association, and the Stoy soils make up about 32 percent. The Hosmer soils are moderately well drained and have a fragipan. They occur on all of the steeper slopes and on some moderate slopes along drainageways. The steeper slopes are severely eroded, particularly in the vicinity of New Grand Chain. The Stoy soils occur mainly on gentle slopes but are also on the moderate slopes along drainageways.

The rest of this association, or about 28 percent, consists mainly of the somewhat poorly drained Belknap soils, which are on bottom lands, and the poorly drained Weir soils, which are in small level or nearly level areas. The Weir soils have a claypan.

This association is used mostly for crops, particularly corn, soybeans, wheat, and rotation meadow. A considerable acreage is used for permanent pasture, but little is wooded.

Providing adequate drainage is a problem on the level or nearly level soils, and control of erosion is important on the more sloping soils. Maintenance of the organic-matter

content and maintenance of tilth are particular problems on the poorly drained soils and on the severely eroded soils. Maintenance of fertility is a general problem throughout the association.

6. Ginat-Weinbach-Sciotoville association

Deep soils that have a moderately fine textured or fine textured subsoil and a medium-textured or moderately fine textured substratum; level to sloping stream terraces

This association consists of low stream terraces closely intermingled with long narrow bottom lands. It occurs principally along the Cache River. Other areas are around Horseshoe Lake and along the Ohio River near America. The difference in elevation between the terraces and the bottom lands varies. In some places it is as little as 2 feet, and the terraces are difficult to distinguish from the bottom lands. In other places the difference is 10 feet or more. In width the terraces range from less than 100 feet to more than 1,000 feet. They generally are level or gently sloping (fig. 4), but some short strong slopes occur either where the terraces join the bottom lands or along drainageways. The terraces were derived from alluvial material laid down by the Ohio River during glacial periods. In places the alluvial material is covered with a small accumulation of loess. This soil association occupies about 14 percent of Pulaski and Alexander Counties.

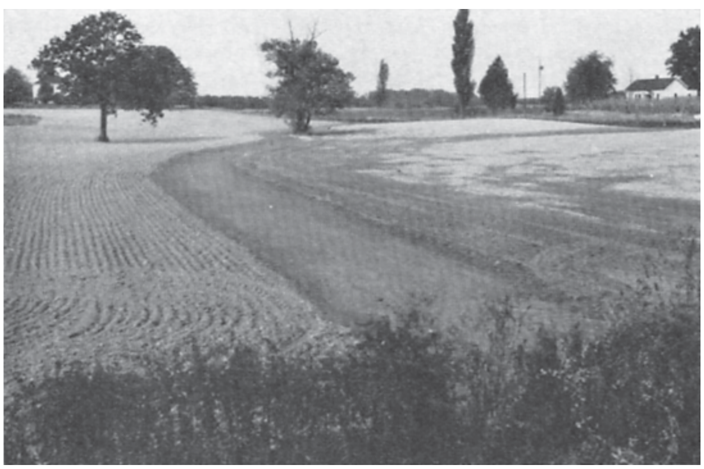

***Figure 4.*—Typical view of the Ginat-Weinbach-Sciotoville soil association. Gently sloping Weinbach silt loam in foreground; nearly level Ginat silt loam in background.**

The poorly drained Ginat soils occupy 28 percent of this association, the somewhat poorly drained Weinbach soils about 16 percent, and the moderately well drained Sciotoville soils about 14 percent. These soils developed mainly in silt loam and silty clay loam sediments and are dominant on the terraces throughout the association.

Minor soils make up about 42 percent of the association. The well drained Wheeling soils are on terraces, where they developed mainly in silt loam and silty clay loam sediments. The poorly drained Okaw soils occur where the underlying sediments are silty clay or clay. The somewhat poorly drained Hurst soils and the moderately well drained Markland soils are closely associated with the Okaw soils and developed in similar sediments. They occur throughout the two-county area but are most common in the vicinity of Tamms. The poorly drained Racoon soils occur mainly near Olive Branch. They are similar to the Ginat soils, except that their silt loam surface layer is more than 24 inches thick. The sandy Alvin, Roby, and Ruark soils, which are dominant in the Alvin-Roby-Ruark association, occur to a minor extent throughout this association. On terraces south and west of Horseshoe Lake are three dark-colored soils: the somewhat poorly drained Millbrook and the moderately well drained Harvard soils, both of which have a silt loam surface layer, and the well drained Disco soil, which has a fine sandy loam surface layer.

Interlaced throughout the terraces, on bottom lands along narrow drainageways and stream channels, are the poorly drained Karnak and Bonnie soils. The Karnak soils have a silty clay loam or silty clay surface layer, and the Bonnie soils have a silt loam surface layer. These two soils make up about 23 percent of the association.

Nearly half of this association is used for crops, principally corn, soybeans, and wheat. Nearly a third is wooded. The rest is used for permanent pasture. Much of the woodland is along streams and drainageways. Some cotton is grown, but the soils as a whole are not well suited to cotton.

Drainage is needed on the poorly drained Ginat, Okaw, and Racoon soils and on the somewhat poorly drained Weinbach, Hurst, and Millbrook soils. Overflow is a hazard on the Karnak and Bonnie soils. Erosion is a problem on all of the sloping soils, but control of erosion is not difficult, because most slopes are gentle or short. Nearly all of the soils are strongly acid and are low in natural fertility.

7. Alvin-Roby-Ruark association

Deep, loamy soils that generally have a moderately fine textured subsoil and a coarse-textured to fine-textured substratum; level to sloping stream terraces

This association consists principally of terraces in the lower half of the Cache River valley, near Pulaski, Unity, Olive Branch, and Horseshoe Lake. In many places the terraces are no more than 2 feet above the surrounding bottom lands. In other places they are as much as 10 feet. Most of the terraces are gently or moderately sloping, some are level or nearly level, and a few are strongly sloping, particularly where they adjoin bottom lands. The soils on terraces were derived chiefly from alluvial material laid down by the Ohio River during glacial periods. They generally have a fine sandy loam surface layer and in most places a stratified sandy, silty, and clayey substratum. This association makes up about 3 percent of the two-county area.

The well-drained, moderately permeable Alvin soils make up about 35 percent of this association, the somewhat poorly drained Roby soils about 10 percent, and the poorly drained Ruark soils about 7 percent.

The rest of this association, or about 48 percent, consists of minor soils. The well-drained, moderately rapidly permeable, dark-colored Disco and light-colored Lamont soils and the rapidly permeable Bloomfield soils are on terraces. Interspersed among these are the Ginat, Weinbach, Sciotoville, and Wheeling soils. The somewhat poorly drained Belknap, the poorly drained Bonnie, and the very poorly drained Karnak soils are chiefly on bottom lands.

Most of this association is used for crops, principally corn, soybeans, wheat, cotton, and rotation pasture. Little of the acreage is used for permanent pasture, and generally only the very poorly drained soils on bottom lands have remained wooded.

Most of the soils need additions of organic matter to help improve tilth, alleviate droughtiness, and control wind erosion. The hazard of wind erosion is especially serious on the Bloomfield soils, which should be protected by growing crops as much of the year as possible. Surface drainage generally is needed on the Ruark soils and in places on the Roby soils. Water erosion is only a slight hazard on the porous soils of this association.

8. Belknap-Bonnie-Haymond association

Light-colored, medium-textured, poorly drained to well-drained, strongly acid to slightly acid soils on bottom lands

This association consists of scattered areas of converging bottom lands that range from a fourth of a mile to a mile in width. It occupies about 7 percent of the area of the two counties.

The Belknap soils make up about 38 percent of the association, the Bonnie soils about 30 percent, and the Haymond soils about 20 percent. The somewhat poorly drained Belknap soils and the poorly drained Bonnie soils generally are strongly acid. They occur principally in Pulaski County, where they are closely associated with soils of the Hosmer-Alford and the Alford-Hosmer associations. The well-drained Haymond soils generally are slightly acid. They occur principally in Alexander County and are closely associated with soils of the Alford-Stookey-Muren and the Stookey-Bodine associations.

About 12 percent of this association consists of the somewhat poorly drained Wakeland soils, the poorly drained Birds soils, and the moderately well drained to well drained Elsah soils. These soils occur principally in Alexander County. The Wakeland and Birds soils generally are slightly acid, and the Elsah soils have chert mixed with the soil material.

Most of this association is used for crops, although the Bonnie soils are also used about equally for pasture and woodland, and the other soils are used to some extent for pasture.

Protection from overflow is the most common problem on these soils. Floods do not remain for long periods, but flash floods may cause scouring and deposition of silt and debris. The poorly drained Bonnie and Birds soils generally need surface drainage, and some areas of the somewhat poorly drained Belknap and Wakeland soils may be benefited by drainage. Surface crusting and poor tilth are common on the Bonnie and Birds soils. Erosion is not a hazard on these level and nearly level soils.

9. Bonnie-Belknap association

Light-colored, medium-textured and moderately fine textured, poorly drained and very poorly drained, strongly acid soils on bottom lands

This association consists of bottom lands, principally along the Cache River, and areas that were once the flood plain of the ancient Ohio River. It covers about 11 percent of Pulaski and Alexander Counties. The soils are wet, light colored, and generally low in fertility. Near the Cache River, they are subject to recurring overflow, and they may be flooded for several days or for weeks at a time. Some areas are too wet for the production of cultivated crops.

The Bonnie soils occupy about 43 percent of this association, and the Belknap soils about 19 percent. The Bonnie soils are poorly drained, and the Belknap are somewhat poorly drained. Both soils have a silt loam surface layer.

The rest of this association, or about 38 percent, consists of minor soils. These include the very poorly drained Cape, Karnak, Piopolis, and Darwin soils, which have a silty clay loam or silty clay surface layer, and the very poorly drained Petrolia soils, which are slightly acid and have a silty clay loam surface layer. The small terraces are occupied by the Ginat, Weinbach, Sciotoville, Wheeling, Alvin, and Roby soils.

Areas that are very wet or that are frequently flooded have remained wooded. Other areas are used for corn, soybeans, wheat, and some cotton. Little of this association is used for permanent pasture.

The soils that are not subject to overflow are moderately productive if they are adequately drained, limed, and fertilized. Additions of organic matter are needed to alleviate surface crusting of the Bonnie soils and to improve the tilth of the Karnak, Piopolis, and Petrolia soils. The soils along the Cache River are used only for woodland because protection from overflow is not economically feasible.

10. Karnak-Darwin association

Light-colored and moderately dark colored, fine-textured, generally very poorly drained, slightly acid and medium acid soils of the bottom lands

This association consists of low areas in the Cache River valley and of bottom lands along the Mississippi River between Gale and McClure. It covers about 8 percent of the two-county area. The soils formed in fine-textured, lake-laid or slack-water sediments and generally are fertile and only slightly acid. They are limited in use, however, because of wetness and poor tilth.

The dominant soils are the light-colored Karnak, which occupy about 60 percent of this association, and the dark-colored Darwin soils, which occupy about 15 percent. The surface layer of these soils is either silty clay or silty clay loam but is dominantly silty clay.

About 25 percent of this association consists of small areas of Jacob clay, Piopolis silty clay loam, Bonnie silt loam, Beaucoup silty clay loam, and Cairo silty clay. The Jacob, Piopolis, and Bonnie soils are light colored and strongly acid, and the Beaucoup and Cairo are dark colored and slightly acid.

The dark-colored Darwin, Beaucoup, and Cairo soils are moderately productive, and drained areas are used for crops. The light-colored Karnak, Jacob, and Piopolis soils are less productive, and only about half of the acreage is used for cultivated crops. The rest is used mostly for woodland. The wetter areas of the dark-colored Darwin, Beaucoup, and Cairo soils are also wooded. Little of this association is used for permanent pasture.

The major problems in this association are removal of excess water, maintenance of fertility, and improvement of tilth. Overflow is a hazard only in sloughs and in areas adjacent to the Cache River.

11. Darwin-Alluvial land-Riley association

Moderately dark colored, generally moderately fine textured, somewhat poorly drained, nearly neutral soils on bottom lands; underlain in many places by sandy strata

This association includes most of the bottom lands along the Mississippi River and bottom lands along the Ohio

River in the vicinity of Mound City and Cairo. Along the Mississippi River, the bottom lands are level to undulating and are dissected in many places by remnants of bayous, sloughs, and stream channels. There are also many old natural levees. Along the Ohio River, the bottom lands are less complex and consist principally of one soil, Allison silty clay loam. The soils in the vicinity of East Cape and those north of Cairo are protected from overflow by levees (fig. 5). The soils in the vicinity of Dogtooth Bend and Sister Island are not protected and thus are subject to overflow by the Mississippi. This association covers about 16 percent of the two-county area. It is almost entirely within Alexander County and includes the area occupied by the Mississippi River.

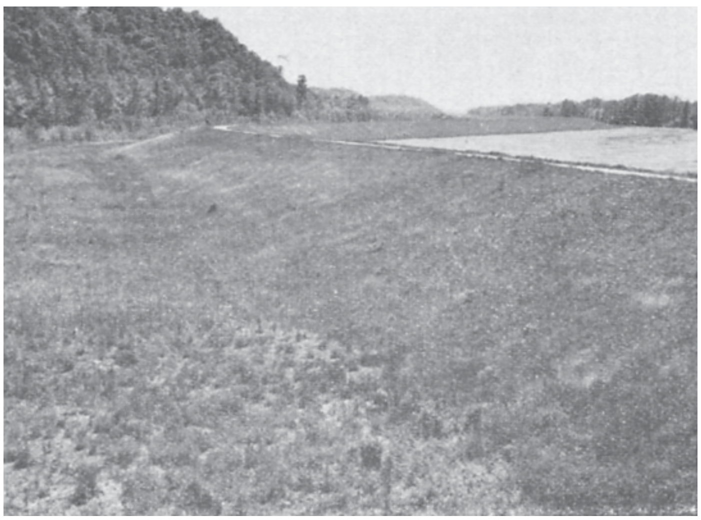

Figure 5.—**Levees on bottom lands along the Mississippi. The levees protect the soils on bottom lands from water that drains from uplands as well as from flooding by the river.**

No one soil is dominant in this association. The soils, in order of decreasing acreage, are Darwin, Alluvial land, Riley, Landes, Ware, Cairo, Tice, Gorham, Newart, Beaucoup, Bowdre, Dupo, Allison, and Sarpy. These soils range from well drained to very poorly drained and from loamy fine sand to silty clay. They generally have very sandy strata either at the surface or at depths ranging to more than 5 feet. The soils are predominantly dark colored and generally are highly productive. They are slightly acid to mildly alkaline and are highly fertile.

Soybeans and corn are the principal crops in this association, but some wheat and cotton are also grown. For many years alfalfa was an important crop in the vicinity of McClure. Little of the land is used for permanent pasture, but some is used for rotation pasture for livestock. Only the soils that are very poorly drained and those that are subject to frequent overflow are wooded.

Drainage is needed in some areas of the poorly drained Darwin, Beaucoup, and Cairo soils and also in places on the somewhat poorly drained Tice, Gorham, Newart, Dupo, and Bowdre soils. Maintenance of good tilth is a problem on the Darwin, Cairo, and Bowdre soils because their surface layer is silty clay. It may also be a problem on the Tice, Gorham, Riley, and Beaucoup soils, which have a silty clay loam surface layer. Additions of organic matter are needed on the Landes and Sarpy soils. The Sarpy soils also need to be protected from wind erosion. Alluvial land is subject to frequent overflow and generally is left wooded.

263-321—68——2

Descriptions of the Soils

This section gives detailed information about the soils of Pulaski and Alexander Counties. It describes the soil series and a representative soil profile, then the soils, or mapping units, in that series. For full information about any one mapping unit, it is necessary to read the description of the soil series as well as the description of the mapping unit. The representative soil profile generally is like that of the first soil described. The description of each of the other soils in the series tells how its profile differs from the representative profile, unless the difference is indicated in the soil name. "Eroded" in the soil name indicates that only 3 to 7 inches of the original surface layer remains. "Severely eroded" indicates that less than 3 inches of the original surface layer remains.

For more general information about the soils, the reader can refer to the section "General Soil Map," in which broad patterns of soils are described. The approximate acreage and proportionate extent of each soil mapped are given in table 1, and their location is shown on the detailed soil map at the back of this survey. The terms "series" and "mapping unit" are defined in the section "How This Survey Was Made." Other technical terms used in the soil descriptions are defined in the Glossary. Technical descriptions of each series are provided in the section "Detailed Descriptions of the Soil Series."

Alford Series

In the Alford series are well-drained, light-colored soils of the uplands. These soils formed in windblown silty material, or loess. The loess deposits are at least 50 inches thick and in most areas are 15 to 40 feet thick. The bedrock underneath the loess generally is massive chert, but in some small areas it is limestone. Near Fayville, Coastal Plain gravel underlies the loess.

Representative profile of Alford silt loam:

0 to 10 inches, brown, friable silt loam; granular structure.
10 to 42 inches, brown, firm silty clay loam; blocky structure.
42 inches to several feet, brown, friable silt loam.

The Alford soils are moderately permeable. They absorb water readily and have high available moisture capacity. They are medium or strongly acid to a depth of at least 60 inches. Their natural fertility is medium, and their response to lime and fertilizer is good. The rate of surface runoff is moderate or high, depending on the slope. Consequently, there is a hazard of erosion.

Alford silt loam, 2 to 4 percent slopes (308B).—This soil occurs only on ridgetops, commonly in long narrow strips flanked by steep hillsides. Generally, from 7 to 14 inches of the original surface layer remains. Included in the areas mapped, however, are small areas where the surface layer is still more than 14 inches thick.

This soil is well suited to pasture and woodland. It can be used safely for crops, if the size, shape, and location of the area permit, and if measures are taken to control erosion. Many areas have never been cultivated. (Management group IIe-1; fruit and vegetable group 1)

TABLE 1.—*Approximate acreage and proportionate extent of the soils*

Soil	Alexander County		Pulaski County	
	Area	Extent	Area	Extent
	Acres	*Percent*	*Acres*	*Percent*
Alford silt loam, 2 to 4 percent slopes	120	0. 1	823	0. 6
Alford silt loam, 4 to 7 percent slopes	905	. 6	1, 532	1. 2
Alford silt loam, 4 to 7 percent slopes, eroded	1, 948	1. 2	4, 746	3. 6
Alford silt loam, 7 to 12 percent slopes	2, 044	1. 3	155	. 1
Alford silt loam, 7 to 12 percent slopes, eroded	1, 305	. 8	2, 254	1. 7
Alford soils, 7 to 12 percent slopes, severely eroded	216	. 1	3, 660	2. 8
Alford silt loam, 12 to 18 percent slopes, eroded	241	. 2	1, 048	. 8
Alford soils, 12 to 18 percent slopes, severely eroded	620	. 4	5, 285	4. 0
Alford silt loam, 18 to 30 percent slopes	326	. 2	1, 027	. 8
Alford silt loam, 18 to 30 percent slopes, eroded	570	. 4	2, 819	2. 2
Alford soils, 18 to 30 percent slopes, severely eroded	894	. 6	2, 668	2. 0
Allison silty clay loam	224	. 1	689	. 5
Alluvial land	3, 626	2. 3	912	. 7
Alvin fine sandy loam, 0 to 2 percent slopes	1, 152	. 7	317	. 2
Alvin fine sandy loam, 2 to 4 percent slopes	1, 105	. 7	1, 358	1. 0
Alvin fine sandy loam, 4 to 7 percent slopes	58	(1)	175	. 1
Alvin fine sandy loam, 4 to 7 percent slopes, eroded	199	. 1	274	. 2
Alvin fine sandy loam, 7 to 12 percent slopes, eroded	151	. 1	233	. 2
Alvin fine sandy loam, thick A2 horizon variant	261	. 2	----	----
Beaucoup silty clay loam	1, 218	. 8	1, 125	. 9
Beaucoup silty clay, overwash	408	. 3	----	----
Belknap silt loam	2, 349	1. 5	13, 269	10. 2
Birds silt loam	1, 897	1. 2	621	. 5
Bloomfield loamy fine sand, 1 to 6 percent slopes	447	. 3	----	----
Bodine cherty silt loam, 30 to 60 percent slopes	2, 197	1. 4	----	----
Bonnie silt loam	4, 991	3. 1	10, 409	8. 0
Bonnie silt loam, wet	182	. 1	1, 430	1. 1
Bonnie silty clay loam, overwash	71	(1)	1, 352	1. 0
Bowdre silty clay, 0 to 2 percent slopes	512	. 3	----	----
Bowdre silty clay, 2 to 7 percent slopes	450	. 3	----	----
Cairo silty clay, 0 to 2 percent slopes	2, 631	1. 7	----	----
Cairo silty clay, 2 to 4 percent slopes	757	. 5	----	----
Cairo silty clay, wet	74	(1)	----	----
Cape and Karnak silty clay loams	2, 910	1. 8	3, 709	2. 8
Cape and Karnak silty clay loams, wet	499	. 3	1, 248	1. 0
Cape and Karnak silt loams, overwash	1, 058	. 7	825	. 6
Darwin silty clay, 0 to 2 percent slopes	5, 439	3. 4	1, 583	1. 2
Darwin silty clay, wet	2, 364	1. 5	705	. 5
Darwin silty clay, 2 to 7 percent slopes	485	. 3	----	----
Darwin silty clay loam	3, 700	2. 3	907	. 7
Disco fine sandy loam	384	. 2	----	----
Drury silt loam, 4 to 12 percent slopes	119	. 1	----	----
Dupo silt loam	2, 199	1. 4	1, 704	1. 3
Elsah silt loam	3, 774	2. 4	----	----
Ginat silt loam	1, 786	1. 1	5, 332	4. 1
Gorham silty clay loam, 0 to 2 percent slopes	2, 968	1. 9	120	. 1
Gorham silty clay loam, 2 to 4 percent slopes	613	. 4	----	----
Harvard silt loam	565	. 4	----	----
Haymond silt loam	3, 393	2. 1	92	. 1
Hosmer silt loam, 2 to 4 percent slopes	57	(1)	2, 561	2. 0
Hosmer silt loam, 4 to 7 percent slopes	147	. 1	904	. 7
Hosmer silt loam, 4 to 7 percent slopes, eroded	335	. 2	5, 054	3. 9
Hosmer soils, 4 to 7 percent slopes, severely eroded	----	----	585	. 4
Hosmer silt loam, 7 to 12 percent slopes, eroded	621	. 4	2, 830	2. 2
Hosmer soils, 7 to 12 percent slopes, severely eroded	407	. 3	4, 553	3. 5
Hosmer silt loam, 12 to 18 percent slopes, eroded	419	. 3	991	. 8
Hosmer soils, 12 to 18 percent slopes, severely eroded	970	. 6	4, 766	3. 7
Hosmer silt loam, 18 to 30 percent slopes, eroded	53	(1)	757	. 6
Hosmer soils, 18 to 30 percent slopes, severely eroded	164	. 1	533	. 4
Hurst silt loam, 0 to 2 percent slopes	599	. 4	243	. 2
Hurst silt loam, 2 to 4 percent slopes	208	. 1	194	. 1
Jacob clay	881	. 6	241	. 2
Karnak silty clay	6, 158	3. 9	3, 288	2. 5
Karnak silty clay, wet	2, 675	1. 7	2, 590	2. 0
Lamont fine sandy loam, 0 to 2 percent slopes	179	. 1	----	----
Lamont fine sandy loam, 2 to 4 percent slopes	235	. 1	60	. 1
Lamont fine sandy loam, 4 to 7 percent slopes	122	. 1	----	----
Landes fine sandy loam, 0 to 2 percent slopes	1, 837	1. 2	83	. 1
Landes fine sandy loam, 2 to 6 percent slopes	854	. 5	----	----
Markland soils, 4 to 12 percent slopes, severely eroded	83	. 1	216	. 2
Millbrook silt loam	819	. 5	----	----
Muren silt loam, 2 to 7 percent slopes	383	. 2	----	----
Muren silt loam, 7 to 12 percent slopes, eroded	177	. 1	----	----
Muren soils, 7 to 12 percent slopes, severely eroded	117	. 1	----	----
Muren silt loam, 12 to 18 percent slopes, eroded	118	. 1	----	----
Muren soils, 12 to 18 percent slopes, severely eroded	600	. 4	----	----
Muren soils, 18 to 30 percent slopse, severely eroded	493	. 3	----	----
Newart silt loam	720	. 5	102	. 1
Okaw silt loam	1, 938	1. 2	903	. 7

See footnote on following page.

TABLE 1.—*Approximate acreage and proportionate extent of the soils*—Continued

Soil	Alexander County		Pulaski County	
	Area	Extent	Area	Extent
	Acres	*Percent*	*Acres*	*Percent*
Okaw silty clay loam	400	.3	347	.3
Petrolia silty clay loam	190	.1	1,898	1.5
Petrolia silty clay loam, wet	63	([1])	565	.4
Piopolis silty clay loam	584	.4	3,010	2.3
Piopolis silty clay loam, wet	190	.1	743	.6
Racoon silt loam	595	.4	405	.3
Riley silty clay loam, 0 to 2 percent slopes	3,437	2.2	-----	-----
Riley silty clay loam, 2 to 4 percent slopes	1,172	.7	-----	-----
Riley silty clay loam, 4 to 7 percent slopes	331	.2	-----	-----
Roby fine sandy loam, 0 to 2 percent slopes	817	.5	901	.7
Roby fine sandy loam, 2 to 4 percent slopes	201	.1	614	.5
Ruark fine sandy loam	1,202	.8	781	.6
Sarpy loamy fine sand	597	.4	-----	-----
Sciotoville silt loam, 0 to 2 percent slopes	421	.3	651	.5
Sciotoville silt loam, 2 to 4 percent slopes	456	.3	1,453	1.1
Sciotoville silt loam, 4 to 7 percent slopes, eroded	187	.1	879	.7
Sciotoville soils, 4 to 7 percent slopes, severely eroded	14	([1])	156	.1
Sciotoville silt loam, 7 to 12 percent slopes, eroded	21	([1])	280	.2
Sciotoville soils, 7 to 12 percent slopes, severely eroded	83	([1])	162	.1
Sharon silt loam	133	.1	570	.4
Stookey silt loam, 12 to 18 percent slopes	264	.2	34	([1])
Stookey silt loam, 18 to 30 percent slopes	3,205	2.0	175	.1
Stookey silt loam, 18 to 30 percent slopes, severely eroded	760	.5	193	.1
Stookey silt loam, 30 to 50 percent slopes	9,349	5.9	282	.2
Stookey-Bodine complex, 18 to 30 percent slopes	831	.5	25	([1])
Stookey-Bodine complex, 30 to 60 percent slopes	18,038	11.4	478	.4
Stoy silt loam, 0 to 2 percent slopes	-----	-----	318	.2
Stoy silt loam, 2 to 4 percent slopes	12	([1])	1,825	1.4
Tice silty clay loam, 0 to 2 percent slopes	2,139	1.3	215	.2
Tice silty clay loam, 2 to 4 percent slopes	353	.2	-----	-----
Tice silty clay, overwash	179	.1	-----	-----
Wakeland silt loam	3,092	1.9	1,451	1.1
Ware silt loam, 0 to 2 percent slopes	1,381	.9	-----	-----
Ware silt loam, 2 to 4 percent slopes	390	.2	-----	-----
Weinbach silt loam, 0 to 2 percent slopes	716	.5	1,840	1.4
Weinbach, silt loam 2 to 4 percent slopes	403	.3	1,858	1.4
Weir silt loam	-----	-----	348	.3
Wheeling silt loam, 0 to 2 percent slopes	233	.1	190	.1
Wheeling silt loam, 2 to 4 percent slopes	156	.1	343	.3
Wheeling silt loam, 4 to 7 percent slopes, eroded	57	([1])	318	.2
Wheeling soils, 12 to 18 percent slopes, severely eroded	65	([1])	111	.1
Borrow Pits	893	.6	749	.6
Horseshoe Lake	1,793	1.1	-----	-----
Made land, airport, etc	927	.6	155	.1
Mississippi River	13,190	8.3	-----	-----
Quarries and gravel pits	49	([1])	109	.1
Water, other	377	.2	268	.2
Total	158,720	100.0	130,560	100.0

[1] Less than 0.05 percent.

Alford silt loam, 4 to 7 percent slopes (308C).—This soil occurs only on ridgetops, commonly in long narrow strips flanked by steep hillsides. Included in some of the areas mapped are small areas that have a slope of less than 4 percent. Also included are spots where the surface layer is still more than 14 inches thick.

This soil can be used safely for crops if the size, shape, and location of the area permit, and if measures are taken to control erosion. It is also well suited to pasture and woodland. If it is used for crops or pasture, the major problems are to control erosion, to dispose of excess water, and to maintain fertility. Most of this acreage has never been cultivated. (Management group IIe–1; fruit and vegetable group 1)

Alford silt loam, 4 to 7 percent slopes, eroded (308C2).—This soil is on narrow to broad ridgetops. Ordinarily, 3 to 7 inches of the original surface layers remains, but in some places all of the original surface layer has been removed. The present plow layer generally is a mixture of subsoil and the remaining surface soil. The plow layer in most places is finer textured and less porous than that of Alford silt loam, 4 to 7 percent slopes.

This soil is well suited to crops if erosion is controlled. It is also well suited to pasture and woodland. Most areas have been cultivated for a long time. The major problems are control of erosion, disposal of excess surface water, and maintenance of fertility. (Management group IIe–1; fruit and vegetable group 1)

Alford silt loam, 7 to 12 percent slopes (308D).—This soil occurs mainly on long narrow ridgetops, but in some places it is on short side slopes between ridgetops and steep slopes, or at the base of steep slopes. Generally, from 7 to 14 inches of the original surface layer remains. Included in the areas mapped, however, are small areas where the surface layer is more than 14 inches thick.

This soil can be used for cultivated crops if the size, shape, and location of the area permit and if measures are taken to control erosion. It is well suited to pasture or

woodland, and most areas are forested. Problems related to control of erosion are maintaining grassed waterways and fertility. (Management group IIIe–1; fruit and vegetable group 2)

Alford silt loam, 7 to 12 percent slopes, eroded (308D2).—This soil occurs on ridgetops, on side slopes between ridgetops and steep slopes, and on foot slopes. The slopes are between 50 and 150 feet in length. Only from 3 to 7 inches of the original surface layer remains. The present plow layer is a mixture of the subsoil and the remaining surface soil. It ordinarily is finer textured and less porous than that of Alford silt loam, 7 to 12 percent slopes. A few small areas where the surface layer is still more than 7 inches thick were included in the areas mapped.

This soil is well suited to pasture or woodland, and it can be used for crops if erosion is controlled. Most of it has been cultivated at some time. The major problems related to control of erosion are maintaining grassed waterways and fertility. (Management group IIIe–1; fruit and vegetable group 2)

Alford soils, 7 to 12 percent slopes, severely eroded (308D3).—These soils occur mainly on side slopes below ridgetops, but they also occur on narrow ridgetops and on foot slopes. The slopes generally are between 75 and 150 feet in length. In most places less than 3 inches of the original surface layer remains, and in many places erosion has cut deeply into the subsoil. The present plow layer consists mostly or entirely of subsoil material. The texture is heavy silt loam or silty clay loam. Surface runoff is rapid, and the hazard of further erosion is serious.

These soils, for the most part, have been cultivated for a long time. They are suited to pasture or woodland but can be used to a limited extent for crops if erosion is carefully controlled. The major problems related to control of erosion are maintaining grassed waterways, fertility, and organic-matter content. (Management group IVe–1; fruit and vegetable group 2)

Alford silt loam, 12 to 18 percent slopes, eroded (308E2).—In Alexander County, this soil occurs on hillsides where the slopes are between 200 and 400 feet in length and, to a limited extent, below ridgetops where the moderately steep slopes are between 50 and 100 feet in length. In Pulaski County, it is on hillsides where the slopes are between 100 and 200 feet in length. Only from 3 to 7 inches of the original surface layer remains. The present surface layer consists of a mixture of subsoil material and the remaining surface soil. Ordinarily, it is finer textured and less porous than that of the slightly eroded Alford soils. Surface runoff is rapid, and the hazard of further erosion is serious. Included in the areas mapped are small areas where the surface layer is more than 7 inches thick, and some small spots where it is less than 3 inches thick.

Most of this acreage has been cultivated at some time. This soil can be used to a limited extent for crops if erosion is carefully controlled. It is well suited to pasture or woodland. The major problems related to control of erosion are maintaining grassed waterways and fertility. (Management group IVe–1; fruit and vegetable group 3)

Alford soils, 12 to 18 percent slopes, severely eroded (308E3).—The remaining surface layer of these soils is less than 3 inches thick, and in some places erosion has cut deeply into the subsoil. The present surface layer is heavy silt loam or light silty clay loam and consists mostly or, in places, entirely of subsoil material. Runoff is rapid, and the hazard of further erosion is serious. Several small areas that are more than 50 percent deeply gullied were included in the areas mapped.

Although most of the acreage has been cultivated, the effects and hazards of erosion are so great that these soils are no longer suitable for crops. They are suitable for pasture or woods. Control of erosion is a problem if the soils are used for pasture. Maintaining grassed waterways and fertility are related problems. (Management group VIe–1; fruit and vegetable group 3)

Alford silt loam, 18 to 30 percent slopes (308F).—This soil occurs mainly on slopes that are between 200 and 400 feet in length. From 7 to 14 inches of the original surface layer remains. The subsoil tends to be thinner and coarser textured than that of the less sloping Alford soils.

Most of the acreage is forested, but this soil can be used for either pasture or forest. It is not well suited to cultivated crops because of the steepness of the slopes and susceptibility to erosion. (Management group VIe–1; fruit and vegetable group 3)

Alford silt loam, 18 to 30 percent slopes, eroded (308F2).—Only from 3 to 7 inches of the original surface layer of this soil remains. The present surface layer generally includes some subsoil material, and there are some small spots where the subsoil is exposed. The subsoil tends to be thinner and coarser textured than that of the less sloping Alford soils. This soil occurs mainly on long slopes. In Alexander County the slopes range from 200 to 400 feet in length. In Pulaski County they range from 100 to 300 feet. Consequently, surface runoff is very rapid, and erosion is a serious hazard. Included in the areas mapped, mostly in those north and west of Olmsted, are a few areas that slope as much as 50 percent. In these areas there are some outcrops of Coastal Plain gravel.

This soil evidently was cultivated at one time. Now, it is not suitable for cultivation, but it is good for pasture or woods. (Management group VIe–1; fruit and vegetable group 3)

Alford soils, 18 to 30 percent slopes, severely eroded (308F3).—Less than 3 inches of the original surface layer of these soils remains. The present surface layer is heavy silt loam or silty clay loam and consists mostly or, in places, entirely of subsoil material. On some slopes northwest of Olmsted, Coastal Plain gravel is exposed. Surface runoff is very rapid, and the hazard of further erosion is serious. Gullied areas and small areas that have a gradient of more than 30 percent were included in the areas mapped.

Most of this acreage was cultivated for some time. Now, these soils are not suitable for cultivated crops, but they are suitable for pasture or woodland. If they are used for pasture, the major problems are to increase and maintain both fertility and the organic-matter content. (Management group VIe–1; fruit and vegetable group 3)

Allison Series

The Allison series consists of well drained and moderately well drained, moderately dark colored soils that formed in silty clay loam sediments more than 50 inches thick. These soils are in broad, level or gently sloping areas near the Ohio River.

Representative profile of Allison silty clay loam:

0 to 13 inches, dark-brown, firm silty clay loam; granular structure.
13 to 27 inches, dark yellowish-brown, firm silty clay loam; blocky structure.
27 to 60 inches, dark yellowish-brown, firm silty clay loam; few light yellowish-brown and strong-brown mottles; blocky structure.

The Allison soils are moderately permeable and have high available moisture capacity. They are fertile and respond well to treatment. The reaction is neutral, and little or no lime is needed.

Allison silty clay loam (0 to 2 percent slopes) (306).—Included in the areas mapped are a few areas in which an overwash of silt loam, from 8 to 15 inches thick, has accumulated on the surface. Also included are some small areas that have a slope of as much as 10 percent.

This soil is used mainly for cultivated crops. It is well suited to crops, and if protected from flooding it is highly productive of pasture. It is also suitable for woodland. Flood protection is the major problem in areas not protected by a levee. Minor problems are maintenance of tilth and maintenance of the organic-matter content. (Areas protected by a levee are in management group I–3; areas subject to flooding are in management group IIw–5; fruit and vegetable group 13)

Alluvial Land

Alluvial land (455) consists of recently deposited sediments that vary widely in texture and commonly are stratified. The surface layer ranges from very dark gray to brown in color. The texture ranges from silty clay loam to coarse sand, and the reaction from neutral to calcareous. The layers range from a few feet to many feet in thickness. There is a wide variation in the amount of stratification.

This land is made up of small areas of such soils as the Tice, Riley, Newart, Landes, and Sarpy along the Mississippi River, and the Allison and Haymond along the Ohio River. Deposition, erosion, and channel cutting caused by frequent overflow are so extensive that a detailed separation of the soils is impractical. The natural vegetation ranges from a recent growth of willows and other plants to stands of cottonwood, sycamore, and sweetgum. Some of the more sandy areas are barren.

Most of this acreage is wooded, but a few areas are used for cultivated crops. The major problems are to control flooding and the deposition of new material and to prevent serious stream cutting. (Management group IVw–3; fruit and vegetable group 11)

Alvin Series

In the Alvin series are well drained to moderately well drained, light-colored soils that developed in sandy alluvium. These soils occur in level areas, on low narrow ridges, and on short slopes of terraces along the Cache River.

Representative profile of Alvin fine sandy loam:

0 to 18 inches, brown, friable fine sandy loam; granular structure.
18 to 36 inches, brown to dark-brown, friable sandy clay loam; blocky structure.
36 to 60 inches, dark-brown, friable loamy fine sand mottled in places with gray; stratified in some places with layers of fine sandy loam, loam, or clay loam.

The Alvin soils are moderately permeable, but their available moisture capacity is not adequate for best plant growth. These soils are acid in reaction and medium in natural fertility, but they respond well to treatment. Their porous surface layer reduces the rate of surface water runoff. Consequently, the hazard of erosion is low or moderate.

Alvin fine sandy loam, 0 to 2 percent slopes (131A).—This soil has a surface layer that in most places is between 14 and 24 inches thick. Included in mapping, however, were a few areas where the surface layer is less than 14 inches thick, and a few areas where it is more than 24 inches thick. Also included were small areas of Wheeling and Lamont soils and some areas where the surface layer ranges to very fine sandy loam or loam.

Although somewhat droughty, this soil is well suited to crops, pasture, and woodland. The major problem is to maintain fertility. (Management group IIs–1; fruit and vegetable group 7)

Alvin fine sandy loam, 2 to 4 percent slopes (131B).—This soil occurs mainly on long low ridges, on side slopes that are 100 feet or less in length. It is slightly eroded, and the surface layer of fine sandy loam is from 7 to 14 inches thick. Included in the areas mapped are small areas where the surface layer is as much as 24 inches thick and other areas where the surface layer is only 3 to 7 inches thick. Also included are small areas of Wheeling and Lamont soils and some areas where the surface layer ranges to very fine sandy loam or loam.

Although somewhat droughty, this soil is well suited to crops, pasture, and woodland. The major problem is maintenance of fertility. Control of erosion is a minor problem. (Management group IIe–3; fruit and vegetable group 7)

Alvin fine sandy loam, 4 to 7 percent slopes (131C).—This soil is slightly eroded, and the surface layer is from 7 to 12 inches thick. It occurs on long low ridges that rise slightly above surrounding terraces and on the short side slopes of terraces, adjacent to bottom lands. These ridges and slopes generally are about 125 to 200 feet wide and from 500 to 2,500 feet long. The areas mapped near Tamms include a few small areas of somewhat poorly drained Roby soils that have a slope range of 4 to 7 percent.

Although somewhat droughty, this soil is suited to crops, pasture, or woodland. The major problems are control of erosion and maintenance of fertility. (Management group IIe–3; fruit and vegetable group 7)

Alvin fine sandy loam, 4 to 7 percent slopes, eroded (131C2).—This soil generally occurs on terraces, on side slopes that range from 50 to 100 feet in length. Only from 3 to 7 inches of the original surface layer remains. The present plow layer includes some of the finer textured subsoil material and is less porous than that of the uneroded Alvin soils. Thus, the hazard of erosion is moderate. Included in the areas mapped are small areas where the surface layer is more than 7 inches thick and a few areas where the surface layer is less than 3 inches thick. Also included are a few areas of somewhat poorly drained Roby soils, small areas of Wheeling and Lamont soils, and some areas where the surface layer ranges to very fine sandy loam or loam.

Although droughty, this soil is suited to crops, pasture, or woodland. The major problems are to control erosion and to maintain fertility. (Management group IIe–3; fruit and vegetable group 7)

Alvin fine sandy loam, 7 to 12 percent slopes, eroded (131D2).—This soil is on terraces, on side slopes that range from 50 to 100 feet in length. Only from 3 to 7 inches of the original surface layer remains, and the plow layer includes some of the finer textured subsoil material. The present surface layer is less porous than that of the uneroded Alvin soils, and the hazard of erosion is moderate. Included in the areas mapped are small areas where from 7 to 14 inches of the original sandy surface layer remains. Also included are small areas of severely eroded Alvin soils. In these areas the plow layer consists mostly or entirely of subsoil material. It is yellowish brown and is much less porous than that of the typical soil, and the hazard of further erosion is great. Small areas of Lamont and Wheeling soils were also included in mapping. The Lamont soil tends to be droughty.

This soil ordinarily is farmed with adjacent soils. Although somewhat droughty it is suited to cultivated crops if adequate measures are taken to control erosion. It is also well suited to pasture or woodland. The major problems are control of erosion and maintenance of fertility. (Management group IIIe–1; fruit and vegetable group 7)

Alvin Series, Thick A2 Horizon Variant

This variant consists of well-drained, light-colored soils that developed in sandy alluvial material deposited by the Ohio River. These soils occur on low terraces, principally west of Unity and around Horseshoe Lake. They differ from the typical Alvin soils in that their surface layer is much thicker. Their surface layer ranges from 24 to 40 inches in thickness.

Representative profile of Alvin fine sandy loam, thick A2 horizon variant:

0 to 10 inches, brown, friable fine sandy loam; single grain.
10 to 28 inches, dark-brown, friable fine sandy loam; thick, platy structure.
28 to 35 inches, brown, firm heavy loam; blocky structure.
35 to 50 inches, brown, firm sandy clay loam; blocky structure.
50 to 60 inches +, dark yellowish-brown, loose loamy fine sand or fine sandy loam; single grain.

Alvin fine sandy loam, thick A2 horizon variant (0 to 1 percent slopes) (V131).—This soil is moderately rapidly permeable. It is moderate in available moisture capacity and tends to be droughty. The reaction is acid, and natural fertility is medium, but crops respond well to management.

Although droughty, this soil is well suited to cultivated crops, and it is used mainly for this purpose. It is also suitable for pasture or woodland. The major problem is maintenance of fertility. Wind erosion is a hazard if this soil is poorly managed. (Management group IIs–1; fruit and vegetable group 7)

Beaucoup Series

In the Beaucoup series are poorly drained or very poorly drained, moderately dark colored soils that formed in silty clay loam sediments more than 40 inches thick. These soils are in level to gently sloping areas and depressions on bottom lands.

Representative profile of Beaucoup silty clay loam:

0 to 6 inches, very dark grayish-brown, friable to firm silty clay loam; blocky structure.
6 to 13 inches, very dark gray, firm silty clay loam mottled with yellowish brown; blocky structure.
13 to 35 inches, grayish-brown, firm silty clay loam mottled with yellowish brown; weak, blocky structure.
35 to 50 inches, gray or grayish-brown silty clay loam mottled with yellowish brown; massive.

In a few places thin sandy or silty strata occur above a depth of 40 inches, and in some places sandy materials occur below a depth of about 50 inches. In most places, however, the Beaucoup soils are underlain by thick layers of clayey sediments.

Permeability is moderately slow in these soils, and surface runoff is slow to ponded. In undrained areas, the water table is close to the surface during much of the year. These soils have high available moisture capacity, are slightly acid or neutral in reaction, and are moderately high in fertility. The response to treatment is good.

Beaucoup silty clay loam (0 to 4 percent slopes) (70).—This soil occurs in broad level areas and in long narrow depressions along drainageways. In most places the slope is 1 percent or less, but some short slopes range to as much as 4 percent. Included in the areas mapped are small areas in which the sandy or silty strata or the clayey layers occur at a depth of less than 40 inches.

This soil is used principally for cultivated crops, but it is also suited to pasture and woodland. The major problems are disposal of excess water and protection from overflow. Minor problems are the maintenance of both fertility and tilth. (Management group IIw–4; fruit and vegetable group 14)

Beaucoup silty clay, overwash (0 to 1 percent slopes) (70+).—This soil occurs in depressions and in level areas near the Mississippi River. It has from 8 to 15 inches of dark-colored silty clay overwash over the original surface layer.

This soil can be used for crops or for woodland. The major problem is protection from overflow. Maintenance of tilth is a secondary but important problem. (Management group IIw–4; fruit and vegetable group 14)

Belknap Series

The Belknap series consists of somewhat poorly drained, light-colored soils that formed in medium or strongly acid silt loam sediments more than 40 inches thick. These sediments washed mainly from nearby loess-covered uplands. The Belknap soils occur as small to large areas on bottom lands throughout Pulaski County and on bottom lands along the Cache River in Alexander County.

Representative profile of Belknap silt loam:

0 to 12 inches, brown, friable silt loam; granular structure.
12 to 50 inches, mixed dark grayish-brown and pale-brown, friable silt loam mottled with yellowish brown to gray; massive.

These soils are moderately slowly permeable, and they have high available moisture capacity. The water table is high during the wettest part of the year. The reaction is acid, and natural fertility is medium, but the response to treatment is favorable.

Belknap silt loam (0 to 4 percent slopes (382).—This soil is extensive throughout the two-county area. In most places the slope is less than 1 percent. Areas that have a gradient of more than 1 percent generally are less than 10 acres in size and are used for pasture or woodland. Included in the areas mapped are four areas, totaling about 150 acres, along the Cache River. These areas are frequently flooded and have had from 8 to 20 inches of light-colored

silty clay loam deposited on the surface. In about half of these included areas the water table is high for several months each year. Some slightly acid areas were also included in mapping.

This soil is used extensively for cultivated crops. It is well suited to crops and is also suited to pasture and woodland. The principal problems are disposal of excess water, maintenance of fertility, and, in some areas, protection from overflow. (Management group IIw–3; fruit and vegetable group 10)

Birds Series

The Birds series consists of poorly drained, light-colored soils that formed in slightly acid or neutral silt loam sediments more than 40 inches thick. The sediments washed mainly from deep loessal deposits on nearby uplands. These soils occur principally as medium-sized or large areas of bottom lands in Alexander County.

Representative profile of Birds silt loam:

0 to 7 inches, grayish-brown, friable silt loam mottled with light brownish gray; weak, granular structure.
7 to 50 inches, gray to light brownish-gray, friable silt loam mottled with brown; massive.

In some areas, particularly near the bluffs along the Mississippi River, the texture is almost very fine sandy loam. In many places there are fragments of chert in the soil material.

The Birds soils are slowly permeable, and they have high available moisture capacity. The water table is high during wet periods. These soils are medium in natural fertility and are only slightly acid. The response to treatment is moderate.

Birds silt loam (0 to 4 percent slopes) (334).—Although the slope ranges up to 4 percent, in most areas it is less than 1 percent. Included in the areas mapped are some areas that are medium acid.

Most of this soil can be used for crops, pasture, or woodland. Some areas, however, are not suitable for crops because they are ponded or the water table remains at or near the surface too late in the year for the soil to be cultivated. These areas are indicated on the detailed soil map by a wet spot symbol. If drained, they can be used and managed in the same way as other areas of Birds soil. The major problems are protection from overflow, disposal of excess water, maintenance of fertility, and maintenance of the organic-matter content. (Wet spots are in management group Vw–1, other areas are in management group IIIw–3; fruit and vegetable group 11)

Bloomfield Series

The Bloomfield series consists of well-drained to somewhat excessively drained, light-colored sandy soils that developed in wind- or water-worked loamy fine sand deposited by the Ohio River. These soils are on low ridges and in level areas in the Cache River valley.

Representative profile of Bloomfield loamy fine sand:

0 to 8 inches, dark-brown, friable loamy fine sand; single grain.
8 to 42 inches, dark yellowish-brown to brown, friable loamy fine sand to fine sand; single grain.
42 to 52 inches, dark yellowish-brown, slightly firm fine sandy loam; weak, blocky structure.
52 inches to several feet, yellowish-brown, loose fine sand.

Between depths of 40 and 60 inches, there is at least one thin layer that ranges from fine sandy loam to light sandy clay loam in texture. In some places there is more than one very thin layer of this finer textured material.

The Bloomfield soils are rapidly permeable, and because they are sandy they have a low available moisture capacity. They have a slow rate of surface runoff and as a whole are not seriously affected by water erosion, but they are likely to be damaged by wind erosion if not protected by vegetation. Natural fertility is low, and productivity is also low, even if management is good.

Bloomfield loamy fine sand, 1 to 6 percent slopes (53B).—Although the slope ranges from 1 to 6 percent, in most areas it is between 2 and 4 percent. Included in the areas mapped are a few areas that are steeper than 6 percent and some areas where the dark-brown surface layer has been removed by erosion. Also included are some areas that have layers of fine sandy loam less than 10 inches thick above a depth of 40 inches.

This soil is suitable for pasture or woodland, and although droughty, it can be used to a limited extent for crops. Sand blowouts are likely to occur in areas not protected by a cover of vegetation. During heavy rains, the stronger slopes are subject to water erosion. The major problems are control of wind erosion, maintenance of the organic-matter content, and maintenance of fertility. (Management group IVs–1; fruit and vegetable group 8)

Bodine Series

The Bodine series consists of shallow, light-colored, somewhat excessively drained soils that developed in silty material less than 20 inches thick over very cherty material. The silty material generally contains many fragments of chert. These soils occur in very steep areas on uplands in Alexander County.

Representative profile of Bodine cherty silt loam:

0 to 6 inches, dark grayish-brown, friable cherty silt loam; granular structure.
6 to 20 inches, pale-brown, friable to slightly firm very cherty silt loam; blocky structure between chert fragments.
20 to 30 inches, strong-brown, slightly firm, very cherty heavy silt loam; blocky structure between chert fragments; many large stones.
30 inches +, shattered rock and bedrock.

The overlying silty material ranges from about 3 to 20 inches in thickness. In some places it contains only a few fragments of chert, and in other places there are numerous fragments. The underlying material is mainly chert. Silt fills the spaces between the chert.

Surface runoff is rapid, permeability is moderate or moderately rapid, and the available moisture capacity is low or very low because of the high content of chert. These soils are naturally strongly acid, and they are low in fertility.

Bodine cherty silt loam, 30 to 60 percent slopes (471G).—Included in the areas mapped as this soil are some small areas of Stookey soils, on the upper part of slopes. Alluvial and colluvial deposits of mixed silty material and chert fragments are common at the base of slopes. Small boulders and outcrops of bedrock occur in some areas. Where the silty surface layer is about 20 inches thick and the slope is less than 35 percent, this soil has a thin silty clay loam subsoil.

Most of this soil is wooded. The hazard of erosion is severe if the timber is removed. Droughtiness, steepness, and stoniness are the major limitations. (Management group VIIs–1; fruit and vegetable group 3)

Bonnie Series

The Bonnie series consists of poorly drained, light-colored soils that formed in medium acid or strongly acid silt loam sediments more than 40 inches thick. The sediments washed mainly from nearby loess-covered uplands. These soils occur on broad bottom lands throughout Pulaski County and on bottom lands along the Cache River in Alexander County.

Representative profile of Bonnie silt loam:

0 to 7 inches, mixed brown and grayish-brown, friable silt loam; few yellowish-brown mottles; granular structure.
7 to 12 inches, mixed light brownish-gray and light-gray, friable silt loam mottled with yellowish brown; massive.
12 to 50 inches, gray and grayish-brown, friable silt loam, mottled with yellowish brown; massive.

The Bonnie soils are slowly permeable, and they have high available moisture capacity. The water table is high during wet periods. These soils are acid, and they are low in natural fertility. The response to treatment is moderate.

Bonnie silt loam (0 to 4 percent slopes) (108).—This soil occurs principally in large nearly level areas, but there are a few small areas that have a slope of as much as 4 percent. Included in the areas mapped are several areas in which silty clay loam or sandy loam has been deposited over the original silt loam surface layer. Also included are a few areas that are slightly acid. In some places, layers of silty clay loam or silty clay occur below a depth of 40 inches. Where this soil occurs next to the Karnak soils, the depth to these finer textured layers may be as little as 24 to 30 inches.

This soil is suitable for crops, pasture, or woodland and is used mainly for crops. The major problems are disposal of excess water, protection from overflow, maintenance of fertility, and maintenance of the organic-matter content. (Management group IIIw–3; fruit and vegetable group 11)

Bonnie silt loam, wet (0 to 4 percent slopes) (W108).—This soil occurs mainly along the Cache River. It is used principally for woodland, but many areas are suitable for pasture. It is flooded or has a water table at or near the surface too late in the season to allow seedbed preparation. Where this soil is drained or protected from overflow, it can be used for crops. (Management group Vw–1; fruit and vegetable group 15)

Bonnie silty clay loam, overwash (0 to 1 percent slopes) (108+).—This soil is adjacent to the Cache River. From 8 to 20 inches of light-colored silty clay loam has been deposited on the original silt loam surface layer. This soil is flooded or has a water table at or near the surface too late in the season to allow seedbed preparation. Its best use at the present time is woodland. It can be used for crops or pasture, however, if it is adequately drained and protected from overflow. (Management group Vw–1; fruit and vegetable group 15)

Bowdre Series

In the Bowdre series are moderately dark colored, poorly drained or somewhat poorly drained soils that formed in 10 to 30 inches of nearly neutral silty clay sediments over sandy sediments. These soils occur mainly on gently undulating to moderately sloping ridges. A few areas are in sloughs on bottom lands along the Mississippi River.

Representative profile of Bowdre silty clay:

0 to 15 inches, very dark gray, very firm silty clay; blocky structure.
15 to 20 inches, mixed dark-gray, friable clay loam and yellowish-brown fine sandy loam mottled with strong brown; weak, blocky structure.
20 to 50 inches, dark-brown to yellowish-brown loamy fine sand mottled with gray and yellowish brown; single grain.

The Bowdre soils are slowly permeable. Surface runoff is medium to ponded. The water table is near the surface during wet periods, and water often stands in depressions. The available moisture capacity is moderate, but the supply of moisture is somewhat limited because of shallowness to the underlying sandy material. These soils are nearly neutral in reaction and are medium in fertility.

Bowdre silty clay, 0 to 2 percent slopes (589A).—This soil generally occurs in very gently sloping areas adjacent to the Darwin, Cairo, and Riley soils and in depressions below the Riley and Landes soils. It is used almost entirely for cultivated crops, but a few small areas are in pasture or woodland. The major problems are disposal of excess water and maintenance of tilth. Protection from overflow is a problem in some areas. (Management group IIw–2; fruit and vegetable group 14)

Bowdre silty clay, 2 to 7 percent slopes (589B).—This soil occurs on the gentle slopes of old natural levees. Most slopes are about 50 feet long. Erosion is a slight hazard, particularly on the stronger slopes. Measures should be taken to control erosion because loss of the silty clay layer will bring the droughty sandy layer closer to the surface.

This soil is used almost entirely for cultivated crops, but it is also suitable for pasture and woodland. The major problems are control of erosion, disposal of excess water, maintenance of tilth, and, in some areas, protection from overflow. (Management group IIw–2; fruit and vegetable group 14)

Cairo Series

The Cairo series consists of dark-colored, poorly drained soils that formed in 30 to 50 inches of nearly neutral silty clay sediments over sandy sediments. These soils are on gently sloping ridges, in level areas, and in sloughs, on bottom lands along the Mississippi River.

Representative profile of Cairo silty clay:

0 to 6 inches, black to very dark gray, very firm light silty clay; blocky structure.
6 to 17 inches, very dark gray, very firm silty clay mottled with yellowish brown and strong brown; blocky structure.
17 to 29 inches, dark-gray, very firm light silty clay mottled with yellowish brown and yellowish red; blocky structure.
29 to 32 inches, very dark gray mixed clay loam and heavy silty clay loam mottled with yellowish brown; firm and massive.
32 to 50 inches, dark yellowish-brown to yellowish-brown, very friable to loose loamy fine sand mottled with yellowish red and strong brown; single grain.

The Cairo soils are slowly permeable and have slow to ponded surface runoff. The water table is near the surface during wet periods, and water often stands in depressions. These soils are moderate in available moisture capacity, are nearly neutral in reaction, and are moderately high in fertility. They respond well to treatment.

Cairo silty clay, 0 to 2 percent slopes (590A).—This soil occurs in very gently sloping areas adjacent to the Karnak and Darwin soils and in depressions below the Riley and Bowdre soils. It is subject to overflow if not protected by a levee.

Areas protected by a levee are suitable for cultivated crops or pasture. Areas not protected can be used for woodland. Protection from overflow, disposal of excess water, and maintenance of tilth are the major problems. (Management group IIIw–4; fruit and vegetable group 14)

Cairo silty clay, 2 to 4 percent slopes (590B).—This soil occurs mainly on gently sloping ridges, or old natural levees, and on breaks between areas of bottom lands. Included in mapping were a few areas that have a slope of as much as 7 percent.

This soil is used principally for cultivated crops. The major problems are protection from overflow and maintenance of tilth. Control of erosion is a minor problem in some areas. (Management group IIIw–4; fruit and vegetable group 14)

Cairo silty clay, wet (0 to 1 percent slopes) (W590).—This soil is flooded or has a high water table too late in the season to allow seedbed preparation for cultivated crops. If properly drained, it can be used and managed in the same way as Cairo silty clay, 0 to 2 percent slopes. At the present time part of it is idle and the rest is wooded. (Management group Vw–1; fruit and vegetable group 15)

Cape Series

The Cape series consists of light-colored, poorly drained or very poorly drained soils that formed silty clay loam sediments 15 to 40 inches thick over silty clay sediments. These soils occur in broad depressions and to a lesser extent in long narrow sloughs, principally on bottom lands along the Cache River.

Representative profile of Cape silty clay loam:

0 to 7 inches, grayish-brown to dark grayish-brown, firm silty clay loam mottled with light gray; massive.
7 to 24 inches, light brownish-gray, firm silty clay loam mottled with yellowish brown; weak, blocky structure.
24 to 50 inches, olive, firm silty clay mottled with yellowish brown and olive yellow; massive.

The Cape soils are very slowly permeable and have a high water table during wet periods. The available moisture capacity is moderate, but during dry periods the supply of moisture may not be adequate for best crop growth. These soils are strongly acid or medium acid and are moderately low in fertility. The response to treatment is fair or moderate.

In Alexander and Pulaski Counties, the Cape soils were mapped only in association with Karnak soils. The Karnak soils are described under the heading "Karnak Series."

Cape and Karnak silty clay loams (0 to 4 percent slopes) (422).—These soils occur mainly in broad level or nearly level areas where surface runoff is very slow or ponded. Some areas mapped are all Cape silty clay loam, some are all Karnak silty clay loam, and some contain both soils. Included in mapping were small sandy spots and a few narrow sloping areas.

These soils are suitable for crops, pasture, or woodland. They are used about equally for crops and woodland and to a lesser extent for pasture. The major problems are disposal of excess water, protection from overflow, maintenance of fertility, and maintenance of the organic-matter content. (Management group IIIw–5; fruit and vegetable group 14)

Cape and Karnak silty clay loams, wet (0 to 1 percent slopes) (W422).—These soils occur mainly in broad depressions or in sloughs. Some areas mapped are all Cape silty clay loam, some are all Karnak silty clay loam, and some contain both soils. Surface runoff is ponded in some areas, and the water table is at or near the surface much of the year. An area of about 140 acres along Sexton Creek, north of Gale, has a silt loam overwash 15 to 20 inches thick.

These soils dry out too late in the season to be used for cultivated crops, but they can be used for woodland or pasture. The major problem is disposal of excess water. Where drainage is feasible and an adequate system is installed, crops can be grown. (Management group Vw–1; fruit and vegetable group 15)

Cape and Karnak silt loams, overwash (0 to 1 percent slopes) (422+).—These soils are in level or nearly level areas, and they receive silty sediments from overflow or from adjacent Bonnie soils. Consequently, they have an overwash of grayish-brown silt loam, 8 to 24 inches thick, over the original silty clay or silty clay loam surface layer. The substratum of silty clay is at a depth of more than 40 inches. The present surface layer is somewhat more porous and friable than that of the underlying material. Included in the areas mapped northeast of Tamms and west of Hodges Park are small areas that have an overwash of sandy material.

These soils are suited to crops, pasture, or woodland. The major problems are disposal of excess water, protection from overflow, and maintenance of fertility. (Management group IIIw–3; fruit and vegetable group 11)

Darwin Series

The Darwin series consists of poorly drained or very poorly drained, moderately dark colored soils that formed in silty clay sediments more than 50 inches thick. These soils are in level or nearly level areas and depressions on bottom lands along the Mississippi and Cache Rivers.

Representative profile of Darwin silty clay:

0 to 14 inches, very dark gray, very firm silty clay; strong, fine, blocky structure.
14 to 40 inches, dark-gray, very firm silty clay or clay mottled with dark brown; weak, blocky structure.
40 to 55 inches +, gray, firm silty clay mottled with yellowish brown; massive.

The Darwin soils are slowly permeable because of the thick layer of silty clay loam to silty clay. The available moisture capacity is high, and the supply of moisture generally is adequate for crops. The water table, however, is often high, or fields may be flooded. Consequently, these soils may be too wet for field crops. They are slightly acid or neutral and are medium in natural fertility.

Darwin silty clay, 0 to 2 percent slopes (71A).—This soil is in broad level areas and in depressions or old sloughs. Included in the areas mapped are three small areas that were once swampy but that now have a 6- to 8-inch layer of organic material, or muck, on the surface. These areas, totaling 136 acres, are west and east of Perks and west of Olive Branch.

This soil is suitable for crops if properly managed, or it can be used for pasture and woodland. It is often flooded

by runoff from adjacent higher areas and by overflow from the Cache River. Where not protected by a levee, it is subject to flooding by the Mississippi. The major problems are the disposal of excess water, protection from flooding, and maintenance of tilth. (Management group IIIw–4; fruit and vegetable group 14)

Darwin silty clay, wet (0 to 1 percent slopes) (W71).—This soil is ponded or it has a high water table too late in the year to be suitable for cultivated crops. Included in the areas mapped are a few small areas that have an overwash of silt loam or silty clay loam over the original surface soil. These areas generally occur in depressions or sloughs.

Ordinarily, this wet soil is used for woodland, but it can also be used for pasture. If drainage is feasible and adequate drains are installed, this soil is suitable for crops. (Management group Vw–1; fruit and vegetable group 15)

Darwin silty clay, 2 to 7 percent slopes (71C).—This soil occurs mainly on short slopes that break from one level of bottom land to another, or along old sloughs and stream channels. Some areas that have a gradient of less than about 4 percent slope are subject to overflow if not protected by levees.

This soil is suitable for crops, pasture, or woodland, and it generally is used in the same way as adjacent soils. The major problems are maintenance of tilth and fertility and, in some places, control of erosion. (Management group IIIw–4; fruit and vegetable group 14)

Darwin silty clay loam (0 to 4 percent slopes) (525).—This soil occurs mainly in broad, level or nearly level areas, but some areas are in depressions or sloughs. The surface layer is 15 to 25 inches thick over the silty clay. In parts of Dogtooth Bend, the surface layer is silt loam. Included in mapping were small areas and short breaks that have a slope of as much as 6 percent. Also included were small areas where the surface layer is less than 15 inches thick.

This soil is suitable for crops, pasture, or woodland but is used mostly for cultivated crops. The major problems are disposal of excess water, protection from overflow, and maintenance of tilth. (Management group IIIw–4; fruit and vegetable group 14)

Disco Series

The Disco series consists of well-drained, moderately dark colored soils that developed in sandy alluvium deposited by the Ohio River. In some places this material possibly is mixed with or is overlain by sandy sediments from the Mississippi River. These soils are on level to gently sloping low terraces west of Horseshoe Lake.

Representative profile of Disco fine sandy loam:

0 to 8 inches, very dark brown, friable fine sandy loam; single grain.
8 to 24 inches, very dark brown, friable loam; weak, blocky structure.
24 to 30 inches, very dark grayish-brown, friable fine sandy loam; weak, blocky structure.
30 to 50 inches, yellowish-brown or brown, friable loamy fine sand; single grain.

The reaction generally is about neutral, but it ranges from neutral to medium acid in the substratum. In some places stratified finer textured material occurs below a depth of about 50 inches.

The Disco soils are moderately rapidly permeable and have low available moisture capacity. Natural fertility is medium or low, but the response to management is good.

Disco fine sandy loam (0 to 4 percent slopes) (266).—The slope ranges from 0 to 4 percent, but about 60 percent of the acreage has a slope of less than 2 percent. On about 32 percent of the acreage, the surface layer is loam, and on about 23 percent, the subsoil is clay loam.

Although droughty, this soil is suited to crops, pasture, or woodland. Because the surface layer is friable and porous, control of erosion is seldom a problem, but simple erosion control measures may be needed on slopes of 3 to 4 percent. The major problem is maintenance of fertility. (Management group IIIs–1; fruit and vegetable group 8)

Drury Series

The Drury series consists of well-drained, light-colored soils that developed in silty material washed from the bluffs along the Mississippi River. These soils are on foot slopes and fans at the base of the bluffs. They occur on bottom lands along the Mississippi River from McClure to Fayville, in Alexander County.

Representative profile of Drury silt loam:

0 to 9 inches, dark grayish-brown to dark yellowish-brown, friable silt loam; granular structure.
9 to 27 inches, dark-brown, friable silt loam; blocky structure.
27 to 50 inches +, dark yellowish-brown, friable silt loam mottled with yellowish brown; massive.

The Drury soils are moderately permeable and have high available moisture capacity. They are slightly acid or neutral. Natural fertility is moderate, and the response to treatment is good. Erosion is a moderate hazard.

Drury silt loam, 4 to 12 percent slopes (75D).—In some places this soil is eroded, and only 3 to 7 inches of the original surface layer remains. In most places, however, the remaining surface layer is from 7 to 14 inches thick. Included in mapping were small areas where the soil is medium acid, small areas that are moderately well drained, and small areas where the subsoil is heavy silt loam. Also included are some areas where the soil material is mixed with gravel, stones, or sand. Because the subsoil is fairly open and porous, the principal effect of erosion is loss of organic matter and decreased fertility.

This soil is suited to crops, pasture, and woodland. The major problem is control of erosion. Minor problems are maintenance of fertility and maintenance of the organic-matter content. (Management group IIIe–1; fruit and vegetable group 2)

Dupo Series

The Dupo series consists of silty, light-colored, somewhat poorly drained soils that formed in 15 to 40 inches of light-colored silt loam sediments over moderately dark colored silty clay loam to silty clay sediments. These soils commonly occur where drainageways from the uplands enter the broad bottom lands.

Representative profile of Dupo silt loam:

0 to 12 inches, brown, friable silt loam; granular structure.
12 to 24 inches, brown, friable silt loam mottled with yellowish brown; massive.
24 to 48 inches, dark-gray, firm silty clay loam or silty clay mottled with yellowish brown; massive.

Permeability is moderately slow because of the fine-textured underlying material. Surface runoff is slow, and the available moisture capacity is high. The Dupo soils

normally are neutral or slightly acid, and they are moderate in fertility. The response to treatment is good. In some areas on bottom lands along the Cache River, the soils are strongly acid.

Dupo silt loam (0 to 1 percent slopes) (180).—Included with this soil in mapping were small areas where the surface layer is very dark gray. Most of these areas are south of the town of Pulaski and in the vicinity of Dogtooth Bend. These darker colored soils commonly are highly stratified. In a few small areas, in place of the underlying dark-colored layer, there is a light-colored, fine-textured substratum. Small areas that have a slope of more than 2 percent were also included in some of the areas mapped. In the vicinity of McClure in Alexander County, there are several large areas where the surface layer is very fine sandy loam or fine sandy loam. In these areas the surface layer is somewhat more porous and friable than that of the typical Dupo soil, and the reaction is less acid.

This soil is used mainly for cultivated crops, but it is also well suited to pasture or woodland. Many areas are subject to flooding for short periods, and some areas at the base of slopes or along drainageways may receive an overwash of new material. The major problems are providing adequate drainage and protection from overflow. (Management group IIw–3; fruit and vegetable group 10)

Elsah Series

The Elsah series consists of moderately deep, moderately well drained or well drained, light-colored soils that formed in 15 to 40 inches of silt loam sediments over cherty material. These soils are on level to gently sloping, narrow to wide bottom lands in Alexander County.

Representative profile of Elsah silt loam:

0 to 12 inches, dark-brown, friable silt loam; granular structure.
12 to 24 inches, brown, friable silt loam; some chert fragments; massive.
24 to 50 inches, dark-brown, loose very cherty loam or stratified cherty loam and silt loam; single grain.

The Elsah soils have slow surface runoff and are moderately permeable. The available moisture capacity is moderate, but the supply of moisture generally is not adequate for best crop growth during normal seasons. Floods of short duration occur in many areas, and some local areas are subject to deposition and stream cutting. These soils are slightly acid or neutral in reaction and medium in fertility.

Elsah silt loam (0 to 4 percent slopes) (475).—In some small areas of this soil, particularly along overflow channels, the surface layer is cherty silt loam. On wide bottom lands, the slope generally is less than 2 percent, and, although droughty, the soil is used mainly for cultivated crops. On narrow bottom lands, the slope generally ranges from 2 to 4 percent, and the soil is used principally for pasture or woodland. Included in mapping were small areas at the base of hills where the slope is stronger than 4 percent.

In some places, simple erosion control measures are needed if cultivated crops are grown. The major problem is maintenance of fertility. Some areas are subject to stream cutting. (Management group IIs–3; fruit and vegetable group 9)

Ginat Series

The Ginat series consists of poorly drained, light-colored soils that formed in medium-textured alluvial materials deposited by the Ohio River. These soils are on level low terraces along the Cache River.

Representative profile of Ginat silt loam:

0 to 8 inches, grayish-brown, friable silt loam; granular structure.
8 to 17 inches, light brownish-gray, friable silt loam mottled with yellowish brown, strong brown, and brownish yellow; weak, platy structure in upper part, blocky structure in lower part.
17 to 35 inches, light brownish-gray to light olive-gray, firm silty clay loam to silty clay mottled with strong brown, yellowish red, and yellowish brown; blocky structure.
35 to 60 inches, gray, friable silty clay loam mottled with yellowish brown; may be stratified with sandy and clayey layers.

The Ginat soils are slowly permeable and have a high water table during wet periods. The available moisture capacity is moderate and is not adequate for best plant growth. These soils are acid, and they are low in natural fertility. The response to treatment is moderate.

Ginat silt loam (0 to 4 percent slopes) (460).—This soil occurs mainly in level areas and on low, narrow to wide terraces that have a slope of less than 2 percent. In places, especially along drainageways, are narrow areas that have a slope of more than 2 percent. In these areas, there has been some erosion, and protection from further erosion is needed. The subsoil normally is silty clay loam, but it ranges from heavy silt loam to silty clay. A few small areas where the surface layer is loam or very fine sandy loam were included in mapping. These areas occur mainly in the vicinity of Ullin, Tamms, and Unity, where the Ginat soil is near the Ruark soil.

This soil is suited to crops, pasture, or woodland. Although it generally is somewhat droughty, the water table is high during wet periods. The major problems are to provide adequate drainage, to increase fertility, and to maintain good tilth. (Management group IIIw–2; fruit and vegetable group 6)

Gorham Series

The Gorham series consists of somewhat poorly drained or poorly drained, moderately dark colored soils that formed in silty clay loam sediments 30 to 50 inches thick over sandy sediments. These soils are in level areas and on slightly undulating ridges on bottom lands along the Mississippi River.

Representative profile of Gorham silty clay loam:

0 to 19 inches, very dark grayish-brown, firm silty clay loam; weak, blocky structure.
19 to 34 inches, dark grayish-brown, friable heavy silt loam mottled with brown; massive.
34 to 49 inches, brown, friable fine sandy loam mottled with light gray; massive.
49 to 60 inches, stratified layers of gray silt loam and fine sandy loam; massive.

In places the heavy silt loam layer is lacking.

The Gorham soils are moderately permeable and have high available moisture capacity. The reaction is nearly neutral, and little or no lime is needed. Fertility is high, and the response to treatment is good.

Gorham silty clay loam, 0 to 2 percent slopes (162A).—This soil generally is level or nearly level, and in some areas

the water table is high for short periods. Drainage is beneficial in these areas. Some areas in Dogtooth Bend are covered with 8 to 18 inches of dark-colored silt loam overwash.

This soil is used mainly for crops. Little of the acreage is used for pasture or woodland. There are no major problems if this soil is protected by levees. Minor problems are the disposal of excess water in some areas, and maintenance of tilth and fertility. (Areas protected by levees are in management group I–3, areas not protected are in group IIw–5; fruit and vegetable group 13)

Gorham silty clay loam, 2 to 4 percent slopes (162B).—This soil occurs on low narrow ridges or on the short breaks from one level of bottom land to another. Thus, the hazard of erosion is slight. Included in mapping were small areas that have a slope range of 4 to 10 percent. These areas total about 110 acres.

This soil is well suited to crops. It is also suited to pasture or woodland but is seldom used for those purposes unless it is adjacent to less productive soils that are used in this way. The major problems are control of erosion, protection from flooding in areas not protected by levees, and maintenance of tilth and fertility. (Management group IIe–4; fruit and vegetable group 13)

Harvard Series

In the Harvard series are moderately well drained or well drained, moderately dark colored soils that formed in medium-textured alluvium deposited by the Ohio River. In some places this material possibly is mixed with or overlain by sediments from the Mississippi River. These soils are on nearly level to very gently sloping low terraces west and south of Horseshoe Lake.

Representative profile of Harvard silt loam:

0 to 9 inches, dark-brown silt loam; granular structure.
9 to 15 inches, brown silt loam mottled with yellowish brown; weak, blocky structure.
15 to 19 inches, dark yellowish-brown, friable light silty clay loam mottled in places with pale brown and dark grayish brown; blocky structure.
19 to 34 inches, dark yellowish-brown, firm clay loam; blocky structure.
34 to 41 inches, dark yellowish-brown, friable sandy clay loam to fine sandy loam; strong-brown streaks and light brownish-gray mottles; blocky structure.
41 to 60 inches, dark yellowish-brown, friable fine sandy loam to loam mottled with gray, or stratified materials ranging from sandy loam to silty clay.

The Harvard soils are moderately permeable and have high available moisture capacity. Natural fertility is high, and the response to treatment is good. The reaction is neutral or slightly acid, and little or no lime is needed.

Harvard silt loam (0 to 2 percent slopes) (344).—The surface layer of this soil normally is silt loam. The subsurface layer is silt loam, loam, or fine sandy loam. Included in mapping were a few areas that have a slope of as much as 4 percent. These included areas are subject to slight erosion.

This soil is well suited to cultivated crops, and it is used almost entirely for this purpose. It is also well suited to pasture and woodland, but the economic returns are likely to be lower if it is used for pasture or wood crops. The major problem is protection from overflow during periods of very high water. (Management group I–1; fruit and vegetable group 4)

Haymond Series

The Haymond series consists of well-drained, light-colored soils that formed in slightly acid or neutral silt loam sediments more than 40 inches thick. These sediments were derived mainly from the very thick mantle of loess on nearby uplands. The Haymond soils occur mainly in small and medium-sized areas on bottom lands along small streams in Alexander County.

Representative profile of Haymond silt loam:

0 to 35 inches, brown, friable silt loam; granular structure.
35 to 50 inches, yellowish-brown, friable silt loam mottled in some places with grayish brown; massive.

Although the texture tends to be coarse silt loam, in some places, particularly in areas near the Mississippi River bluffs, it approaches very fine sandy loam. In many places there are chert pebbles in the soil material.

These soils are moderately permeable and have high available moisture capacity. They are only slightly acid and are moderately high in natural fertility. The response to treatment is good.

Haymond silt loam (0 to 2 percent slopes) (331).—In Alexander County, the areas mapped include some soils that are medium acid, and also some moderately well drained soils that are mottled between a depth of 24 and 40 inches. Slopes of up to 4 percent occur in places along small streams, where the bottom lands either are rounded or slope downward from the valley wall to the stream channel. A few sloping fan-shaped areas occur where drainageways empty into larger bottom lands.

This soil is well suited to crops or pasture. It is also suited to woodland. There are no major problems, but minor problems are to protect the soil from occasional overflow, to prevent streambank cutting (fig. 6), and to maintain fertility. Overflow normally occurs at a time when crops are not likely to be damaged. (Management group I–2; fruit and vegetable group 9)

Figure 6.—Streambank cutting on Haymond and Elsah soils, on bottom lands.

Hosmer Series

The Hosmer series consists of moderately well drained, light-colored soils that have a fragipan (compact layer) in the lower part of the profile. These soils formed in silty

material, or loess, that ordinarily was more than 48 inches thick and in many places more than 80 inches thick. The silty mantle generally was underlain by gravelly and sandy material (fig. 7). In Pulaski County these soils are on gently sloping to moderately sloping ridges or on strongly sloping to very steep hillsides. In Alexander County, they are on foot slopes at the base of steep hillsides.

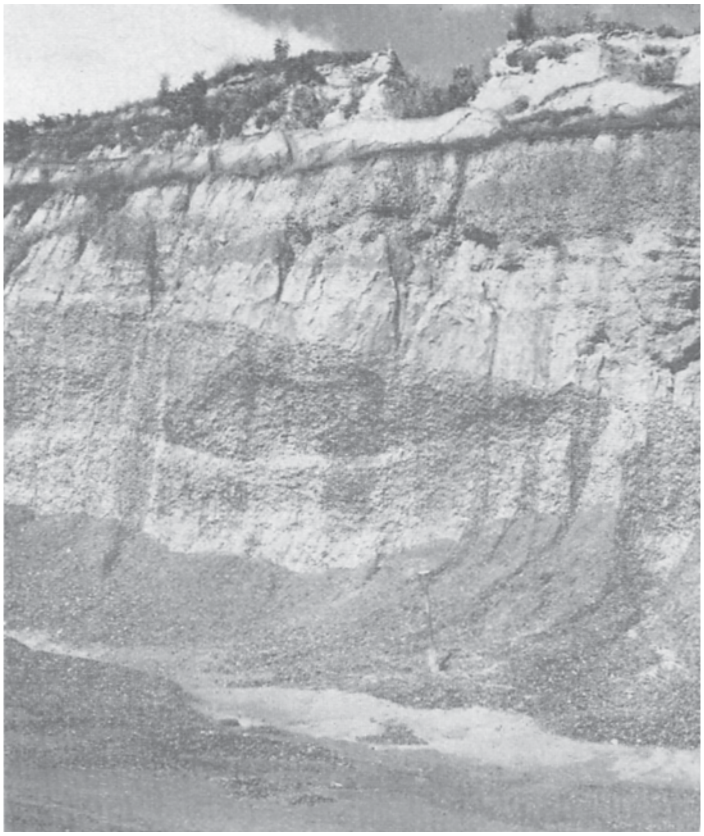

***Figure 7.*—Gravel beds underlying the Hosmer soils. These beds are from 1 to 15 feet or more thick and are generally buried under 5 to 20 feet of loess. They appear at the surface only on a few very steep slopes.**

Representative profile of Hosmer silt loam:

0 to 8 inches, dark-brown, friable silt loam; granular structure.
8 to 11 inches, dark yellowish-brown, friable silt loam; blocky structure.
11 to 17 inches, yellowish-brown, friable silt loam; blocky structure.
17 to 27 inches, yellowish-brown, firm silty clay loam; blocky structure.
27 to 31 inches, mixed pale-brown and yellowish-brown, firm heavy silt loam; blocky structure.
31 to 44 inches, mixed yellowish-brown and light yellowish-brown, firm heavy silt loam to light silty clay loam; blocky structure; this is the top layer of the fragipan.
44 to 60 inches, mixed yellowish-brown and white heavy silt loam; massive; very firm when moist, very hard when dry; this is the main layer of the fragipan.

The Hosmer soils are medium to low in natural fertility and are strongly acid. Surface runoff is slow to rapid, depending on the slope. Permeability is moderately slow in the upper layers and slow in the fragipan. The available moisture capacity is moderate or low, depending on the depth to the fragipan.

Hosmer silt loam, 2 to 4 percent slopes (214B).—This soil is on the gentle slopes of broad ridges, where the erosion hazard is slight. Consequently, most or all of the original, friable, porous surface layer remains. In most places the surface layer is more than 7 inches thick. The depth to the fragipan ranges from 30 to 36 inches. Included in mapping were a few areas where the surface layer is less than 7 inches thick. Also included were small areas of level soils that have a thick surface layer and small areas of somewhat poorly drained soils near the head of drainageways.

This soil is well suited to crops, and where it is adjacent to larger areas that are cultivated, it is used for crops. It is also suitable for pasture or woodland. If it is used for crops, control of erosion is a slight problem. (Management group IIe–2; fruit and vegetable group 1)

Hosmer silt loam, 4 to 7 percent slopes (214C).—This soil generally occurs in areas that are wooded or that have not been cropped intensively. Consequently, it is only slightly eroded. It is suited to crops, pasture, or woodland. The major problem is control of erosion. (Management group IIIe–2; fruit and vegetable group 1)

Hosmer silt loam, 4 to 7 percent slopes, eroded (214C2).—This soil occurs mainly on broad ridges. The slopes range from 75 to 200 feet in length. Over most of the acreage, the remaining surface layer is only 3 to 7 inches thick. It is slightly finer textured and slightly less porous than that of the less eroded Hosmer soils. The fragipan commonly occurs at a depth of 24 to 30 inches. Surface runoff is medium, and the hazard of erosion is moderate. Where this soil occupies short slopes along drainageways in the Hosmer-Stoy soil association, it is more highly mottled than it ordinarily is and in places is alkaline in the substratum.

This soil is used mainly for crops, but it is also suitable for pasture or woodland. The major problems are to control erosion and to maintain fertility. (Management group IIIe–2; fruit and vegetable group 1)

Hosmer soils, 4 to 7 percent slopes, severely eroded (214C3).—Except for a few spots, these soils have been so severely eroded that in most places less than 3 inches of the original surface layer remains. The present surface layer, which consists mostly of silty clay loam, is less friable and porous than that of the less eroded Hosmer soils. Surface runoff is a little more rapid, and the hazard of erosion is greater than on the less eroded soils. The depth to the fragipan is only 18 to 24 inches. Where these soils occupy short slopes along drainageways in the Hosmer-Stoy soil association, they are more highly mottled than they ordinarily are, and in places they are alkaline in the substratum.

These soils are suited to limited cultivation, or they can be used for pasture or woodland. The major problems are to control erosion, to increase fertility, and to increase the organic-matter content. (Management group IVe–2; fruit and vegetable group 2)

Hosmer silt loam, 7 to 12 percent slopes, eroded (214D2).—This soil occurs on ridges where the slopes are from 50 to 150 feet long and on side slopes in more rolling areas where the slopes are somewhat longer. In most areas from 3 to 7 inches of the original surface layer remains. The present plow layer is slightly finer textured and less porous than that of the less eroded Hosmer soils. Surface runoff is moderate, and the hazard of further erosion is

serious. The fragipan generally is at a depth of 22 to 32 inches.

This soil is suitable for pasture, crops, or woodland. The major problem is control of erosion. Maintaining grassed waterways and fertility are related problems. (Management group IIIe–2; fruit and vegetable group 2)

Hosmer soils, 7 to 12 percent slopes, severely eroded (214D3).—These soils occur on ridges where the slopes are from 50 to 150 feet long and on side slopes in more rolling areas where the slopes are somewhat longer. Less than 3 inches of the original surface layer remains. The present plow layer is yellowish-brown heavy silt loam to silty clay loam. It is less friable and porous than that of the less eroded Hosmer soils. In most places the depth to the fragipan is less than 24 inches. Consequently, the rooting depth and available moisture capacity have been reduced. Surface runoff is rapid, and the hazard of further erosion is serious.

These soils are well suited to pasture and woodland, or they can be used to a limited extent for cultivated crops. The major problems related to control of erosion are maintaining grassed waterways, fertility, and organic-matter content. (Management group IVe–2; fruit and vegetable group 2)

Hosmer silt loam, 12 to 18 percent slopes, eroded (214E2).—On about three-fourths of this soil, the remaining surface layer is from 3 to 7 inches thick. On the rest, erosion has been less severe, and more than 7 inches of the original surface layer remains. The present surface layer is slightly finer textured and less porous than that of the less eroded Hosmer soils. Surface runoff is rapid, and the hazard of further erosion is serious. In most places the fragipan is at a depth of 22 to 32 inches.

This soil has been used mainly for pasture or woodland, and thus it has been protected to some extent from erosion. It is suited to limited cultivation if erosion is controlled. (Management group IVe–2; fruit and vegetable group 3)

Hosmer soils, 12 to 18 percent slopes, severely eroded (214E3).—These soils are on steep hillsides and foot slopes. The slopes range from 75 feet to as much as 400 feet in length. In most places less than 3 inches of the original surface layer remains, and in some areas erosion has cut deeply into the subsoil. A few small areas are severely gullied. The present surface layer is yellowish-brown heavy silt loam or silty clay loam. The depth to the fragipan ordinarily is less than 24 inches and in some places is less than 12 inches. Surface runoff is very rapid, and the hazard of further erosion is serious.

These soils have been used for crops for a long time. Now, because of severe erosion, they are not suitable for crops, but they can be used for pasture (fig. 8) or woodland. The major problems related to control of erosion are maintaining grassed waterways, fertility, and organic-matter content. (Management group VIe–2; fruit and vegetable group 3)

Hosmer silt loam, 18 to 30 percent slopes, eroded (214F2).—This soil is on hillsides where the slopes are from 200 to 400 feet long. In most areas only from 3 to 7 inches of the original surface layer remains. The fragipan occurs at a depth of 22 to 32 inches. It is likely to be thinner and less compact than that in the less sloping Hosmer soils. Surface runoff is rapid, and the hazard of further erosion is serious. Included in mapping were small areas that have a slope of more than 30 percent, and a few areas where the surface layer is more than 7 inches thick.

Figure 8.—**An eroded area of Hosmer silt loam that has been renovated and planted to fescue for pasture. Only those areas on which some topsoil remains have produced a stand.**

This soil is used mostly for woodland. It is too steep to be used for crops, but it is suitable for pasture. The major problem is control of erosion. (Management group VIe–2; fruit and vegetable group 3)

Hosmer soils, 18 to 30 percent slopes, severely eroded (214F3).—These soils are on steep hillsides where less than 3 inches of the original surface layer remains. In many areas they are eroded deep into the subsoil, and in a few places they are eroded into the fragipan. The present surface layer consists of yellowish-brown silty clay loam or silt loam. In most deeply eroded areas, the soils commonly are mottled with gray. Surface runoff is rapid, and the hazard of further erosion is serious. Included in mapping were small areas that have a slope of more than 30 percent.

These soils have been cropped intensively in the past, and many areas are still cropped or are left idle. Woodland or pasture is a more suitable use for these soils than crops. Control of erosion and the maintenance of fertility in pastures are the major problems. (Management group VIe–2; fruit and vegetable group 3)

Hurst Series

In the Hurst series are somewhat poorly drained, light-colored soils that formed in silty materials over very fine textured alluvial sediments. These soils are in level areas and on the short side slopes of terraces along the Cache River. They are most common in the vicinity of Tamms.

Representative profile of Hurst silt loam:

0 to 6 inches, brown, friable silt loam; granular structure.
6 to 12 inches, light brownish-gray and pale-brown, friable silt loam mottled with yellowish brown; thick, platy structure that breaks to fine, blocky structure.
12 to 15 inches, light brownish-gray, firm silty clay loam mottled with yellowish brown; blocky structure.
15 to 48 inches, brown, firm silty clay mottled with yellowish brown; blocky structure.
48 to 60 inches, grayish-brown, firm silty clay loam; blocky structure.

Typically, the silty clay layer extends to a depth of several feet, but in Pulaski and Alexander Counties, stratified coarser textured materials may occur below a depth of 40 inches. In areas where the silty clay is several feet thick, these soils are calcareous below a depth of 40 inches.

These soils are very slowly permeable and have moderate available moisture capacity. They are strongly acid and are low in natural fertility. Where they occur on slopes, they are highly erodible. The response to treatment is moderate.

Hurst silt loam, 0 to 2 percent slopes (338A).—This soil occurs in long narrow areas, as small as 2 acres in size, to rounded areas that are 40 acres or more in size. It is associated with the Okaw and Markland soils. The silt loam surface layer ranges from 7 to 24 inches in thickness. In most areas it is between 10 and 14 inches thick, and southwest of Mounds, it generally is about 7 or 8 inches thick. Included in a few of the areas mapped are some spots of a moderately well drained soil. In these spots, coarser textured sediments occur within 50 to 60 inches of the surface.

This soil is suited to crops, pasture, or woodland. The major problems are to provide adequate drainage, to maintain fertility, and to maintain the organic-matter content. (Management group IIIw–1; fruit and vegetable group 5)

Hurst silt loam, 2 to 4 percent slopes (338B).—This soil occurs mainly in long narrow areas that are between 2 and 10 acres in size. In most areas the remaining surface layer is more than 7 inches thick. Included in the areas mapped, however, are a few areas where the surface layer is less than 7 inches thick. Also included are a few areas of the poorly drained Okaw soils and several areas of the moderately well drained Markland soils that have slopes of 2 to 4 percent. Included in some of the areas in Alexander County are small areas where the lower part of the substratum contains stratified coarser textured material.

This soil is suited to crops, pasture, or woodland. The major problems are to control erosion, to provide adequate drainage, to maintain fertility, and to maintain the organic-matter content. (Management group IIIw–1; fruit and vegetable group 5)

Jacob Series

The Jacob series consists of light-colored, very poorly drained, extremely acid soils that formed in clay sediments more than 50 inches thick. These soils occur principally on bottom lands along the Cache River, near Unity and east and south of Horseshoe Lake.

Representative profile of Jacob clay:

0 to 6 inches, grayish-brown, very firm clay mottled with gray; blocky structure.
6 to 24 inches, light-gray, very firm clay mottled with yellowish red; weak, blocky structure.
24 to 50 inches, light brownish-gray to olive-gray, very firm clay mottled with yellowish red; massive.

The Jacob soils are very slowly permeable. The amount of moisture available to crops is moderate to low because of the retention of water by the heavy clay. The water table is near the surface during much of the year. These soils are extremely acid, and they are low in fertility. The response to treatment is low.

Jacob clay (0 to 1 percent slopes) (85).—Most of this soil occurs in level areas and depressions, although there are two small sloping areas just south of Gale.

This soil is suitable for either woodland or pasture, and some areas can be used to a limited extent for cultivated crops. Other areas are flooded too frequently or have a high water table too late in the season to be used for crops, but they can be used for woodland. These areas may be suited to limited cultivation if they are properly drained or protected from flooding, but the cost of these improvements probably would be greater than the return from crops. The major problems are protection from flooding and maintenance of fertility and tilth. (Management group IVw–2; wet spots are in management group Vw–1; fruit and vegetable group 14)

Karnak Series

In the Karnak series are light-colored, very poorly drained soils that formed in silty clay sediments more than 50 inches thick. These soils are on bottom lands along the Mississippi and Cache Rivers. The individual areas vary greatly in size, from broad level areas to long narrow depressions in sloughs.

Representative profile of Karnak silty clay:

0 to 7 inches, dark grayish-brown, firm silty clay; weak, blocky structure.
7 to 20 inches, dark-gray, very firm silty clay mottled with yellowish brown; weak, blocky structure.
20 to 30 inches, gray, very firm silty clay mottled with strong brown; moderate, blocky structure.
30 to 45 inches, mixed gray and strong-brown, very firm silty clay; massive.

The Karnak soils are very slowly permeable, and the water table is near the surface during much of the year. The available moisture capacity is moderate, but at times the supply of moisture is not adequate for good crop growth. The depth of the root zone is limited by the clayey layer and by the high water table. These soils ordinarily are slightly acid to neutral in reaction but range to strongly acid in places. They are moderately low in fertility. The response to treatment is only fair.

Karnak silty clay (0 to 1 percent slopes) (426).—This is an extensive soil. It occurs mainly in broad level areas from which runoff is very slow, or in old sloughs. It is suitable for crops, pasture, or woodland. It is used about equally for crops and woodland, but at the present time little of the acreage is used for pasture. The major problems are providing adequate drainage, providing protection from overflow, and maintaining tilth and fertility. (Management group IIIw–5; fruit and vegetable group 14)

Karnak silty clay, wet (0 to 1 percent slopes) (W426).—This soil occurs in depressions throughout both counties. In most places the water table is at or near the surface too late in spring for this soil to be used for cultivated crops. In others continued overflow prevents such use. Some areas remain wet or are under water throughout the year.

This soil is suitable for woodland or for pasture. If drainage is feasible and an adequate system is installed, this soil may be suitable for crops. These areas would then be in management group IIIw–5. (Management group Vw–1; fruit and vegetable group 15)

Lamont Series

The Lamont series consists of well-drained, light-colored sandy soils that formed in alluvial material deposited by the Ohio River. These soils are in level areas and on low ridges of terraces, mainly west of Unity and south of Horseshoe Lake.

Representative profile of Lamont fine sandy loam:

0 to 8 inches, dark grayish-brown, friable fine sandy loam.
8 to 23 inches, yellowish-brown, friable loamy fine sand to fine sandy loam.
23 to 56 inches, dark-brown to yellowish-brown fine sandy loam to loam; weak, blocky structure.
56 to 65 inches, brown to dark yellowish-brown, stratified layers of loamy fine sand and loam.

The Lamont soils are moderately rapidly permeable. Surface runoff is slow, but the available moisture capacity is not adequate for good crop growth. These soils are acid and are low in natural fertility. Their response to management is moderate.

Lamont fine sandy loam, 0 to 2 percent slopes (175A).—This soil occurs mainly in broad nearly level areas. In most areas the surface layer is between 14 and 30 inches thick, but in a large area south of Miller City it is only 7 to 14 inches thick.

Although droughty, this soil is suitable for crops, pasture, or woodland. The major problem is to increase fertility. Control of wind erosion is a slight problem. (Management group IIIs–1; fruit and vegetable group 8)

Lamont fine sandy loam, 2 to 4 percent slopes (175B).—This soil is on long low ridges, on side slopes of terraces, and in broad gently undulating areas. The slopes generally are from 50 to 100 feet in length.

Although droughty, this soil is well suited to crops, pasture, or woodland. The major problem is to increase fertility. A minor problem is control of wind erosion. (Management group IIIs–1; fruit and vegetable group 8)

Lamont fine sandy loam, 4 to 7 percent slopes (175C).—This soil occurs mainly on the side slopes of drainageways or along the edge of terraces. The slopes average 50 feet in length. In most areas the surface layer is 7 to 14 inches thick. In a few areas less than 7 inches of the original surface layer remains, and the present plow layer is a mixture of subsoil and the remaining surface soil.

Although droughty, this soil is suited to crops, pasture, or woodland, but it generally is farmed in the same way as larger areas of adjacent soils. The major problems are to increase fertility and to control water erosion during heavy rains. (Management group IIIs–1; fruit and vegetable group 8)

Landes Series

In the Landes series are well-drained, moderately dark colored soils that formed in fine sandy loam sediments more than 10 inches thick over loamy fine sand to sand. The sediments consist of alluvial deposits from the Mississippi River. These soils are in broad level areas, on long narrow ridges, and on short breaks from one level to another on bottom lands along the Mississippi River.

Representative profile of Landes fine sandy loam:

0 to 12 inches, very dark grayish-brown to dark-brown, friable fine sandy loam; weak, crumb structure.
12 to 25 inches, dark-brown to brown, friable fine sandy loam; weak, crumb structure to massive.
25 to 60 inches, grayish-brown to brown, loose loamy fine sand; in places contains stratified layers of silty clay loam to fine sand.

In places there are thin lenses or strata of silt loam or silty clay loam in the upper 25 inches.

The Landes soils are moderately rapidly permeable, and they have slow surface runoff. The available moisture capacity is moderate, but the supply of moisture is not adequate for best plant growth. The reaction is nearly neutral, and little lime is needed. Natural fertility is medium, but the response to treatment is good.

Landes fine sandy loam, 0 to 2 percent slopes (304A).—In most areas the thickness of the fine sandy loam is between 14 and 30 inches. On about 650 acres, however, the fine sandy loam is only 8 to 14 inches thick, and on about 350 acres it is more than 30 inches thick. Included in mapping were some areas where the surface layer is silt loam, loam, or very fine sandy loam and is less than 8 inches thick.

Although droughty, this soil is suited to crops, pasture, or woodland. Protected areas are used principally for crops. Many areas that are subject to flooding by the Mississippi River are used for woodland. The major problems are protection from overflow and maintenance of fertility. (Management group IIIs–1; fruit and vegetable group 12)

Landes fine sandy loam, 2 to 6 percent slopes (304B).—This soil occurs mainly on narrow ridges or on old natural levees on bottom lands. On nearly half of the acreage the surface layer of fine sandy loam is less than 14 inches thick, and on about 40 acres it is more than 30 inches thick. Where the surface layer is less than 14 inches thick, the soil is somewhat more droughty than it is in other areas.

This soil is used principally for crops, but those areas not subject to overflow are also suitable for pasture. Areas subject to frequent overflow are used mainly for woodland. The major problems are protection from overflow, maintenance of fertility, and maintenance of the organic-matter content. Erosion may be a slight hazard on the stronger slopes during heavy rains. (Management group IIIs–1; fruit and vegetable group 12)

Markland Series

The Markland series consists of moderately well drained, light-colored soils that formed in a thin layer of silty material over very fine textured sediments deposited by the ancient Ohio River. These soils are on low ridges and on short steep slopes of terraces along the Cache River. They are most common in the vicinity of Tamms.

Representative profile of a severely eroded Markland soil:

0 to 4 inches, grayish-brown, firm silty clay loam; granular structure.
4 to 11 inches, brown, firm silty clay; blocky structure; very strongly acid.
11 to 27 inches, dark yellowish-brown or brown, very firm silty clay; blocky structure; strongly acid or medium acid.
27 to 60 inches, grayish-brown, very firm silty clay or clay; some dark yellowish-brown and dark-brown mottles; alkaline (calcareous).

The Markland soils are slowly permeable. The available moisture capacity is a little too low for best plant growth. These soils are strongly acid in the upper part of the subsoil and calcareous in the lower part. Natural fertility is low, and the response to treatment is low.

Markland soils, 4 to 12 percent slopes, severely eroded (467C3).—These soils are on the short sharp breaks from terraces to bottom lands. In most places, less than 3 inches of the original surface layer remains, and in areas that have a slope of more than 7 percent, the soils commonly are eroded into the silty clay material. Consequently, the present plow layer is finer textured and less porous than is normal for the Markland soils. Typically, the clay layer extends to a depth of several feet, but in many places in Pulaski and Alexander Counties, stratified coarser textured material occurs just below a depth of 40 inches or, in eroded areas, at a lesser depth. Where the layers of heavy clay are thin, the soils generally are strongly acid instead of alkaline. Included in mapping were small areas that are only moderately eroded. Also included were small areas of the somewhat poorly drained Hurst soils that are severely eroded.

The Markland soils can be used for pasture or woodland or, to a limited extent, for crops. The major problems are to control erosion, to increase fertility, to maintain the organic-matter content, and to maintain tilth. (Management group IVe–3; fruit and vegetable group 5)

Millbrook Series

The Millbrook series consists of somewhat poorly drained, moderately dark colored soils that formed in medium-textured and fine-textured sediments. These sediments are believed to be alluvium from the Ohio River, possibly mixed with or overlain by sediments from the Mississippi River. These soils are in level areas and depressions on low terraces south and west of Horseshoe Lake.

Representative profile of Millbrook silt loam:

0 to 7 inches, very dark grayish-brown, friable silt loam; granular structure.
7 to 20 inches, mixed dark grayish-brown and very dark grayish-brown, friable silt loam to loam; platy structure.
20 to 30 inches, yellowish-brown firm silty clay loam to clay loam; mottled with grayish brown and yellowish brown; blocky structure.
30 to 40 inches, grayish-brown to light grayish-brown, firm silty clay loam to clay loam mottled with yellowish brown; blocky structure.
40 to 60 inches, grayish-brown to yellowish-brown, stratified loam to fine sandy loam.

The Millbrook soils are moderately slowly permeable and have high available moisture capacity. Natural fertility is medium or high, and the response to treatment is good. Generally, the surface layer is neutral in reaction, but the subsoil is acid.

Millbrook silt loam (0 to 2 percent slopes) (219).—Most of this soil has a surface layer of silt loam, but in some included areas the surface layer is loam. The subsurface layer ranges from silt loam to fine sandy loam. Included in mapping were small areas that have a slope of as much as 4 percent, small areas that are poorly drained, and some areas where the underlying stratified material contains strata of silty clay or loamy fine sand.

This soil is used mainly for cultivated crops. It is also well suited to pasture and woodland, but the economic returns are likely to be less if it is used for those purposes. The major problem is to provide adequate drainage. Minor problems are maintenance of tilth and fertility. This soil is subject to overflow during periods of very high water. (Management group I–1; fruit and vegetable group 5)

Muren Series

The Muren series consists of moderately well drained, light-colored soils that formed in loess deposits that ranged from more than 20 feet thick on ridges to as little as 4 feet thick on steep slopes. These soils occur on ridges and to a lesser extent on side slopes, principally in Alexander County.

Representative profile of Muren silt loam:

0 to 7 inches, dark grayish-brown, friable silt loam; granular structure.
7 to 11 inches, dark yellowish-brown, friable silt loam; platy structure.
11 to 20 inches, yellowish-brown to brown, firm silty clay loam; blocky structure.
20 to 44 inches, dark-brown to brown, firm silty clay loam mottled with grayish brown to reddish brown; blocky structure.
44 to 60 inches, dark-brown to dark yellowish-brown, friable silt loam mottled with yellowish brown to light brownish gray.

The Muren soils are moderately permeable, have moderate surface drainage, and have high available moisture capacity. They are medium in natural fertility and are medium or strongly acid. The response to treatment is good. These soils erode readily if not adequately protected.

Muren silt loam, 2 to 7 percent slopes (453C).—About a fourth of this soil has a slope of less than 4 percent. Slightly more than half is moderately eroded. In the eroded areas the soil is more yellow in color and is slightly less productive than in the other areas.

This soil can be cultivated safely if erosion is controlled. It is well suited to pasture and woodland. Some areas are not easily accessible. (Management group IIe–1; fruit and vegetable group 1)

Muren silt loam, 7 to 12 percent slopes, eroded (453D2).—This soil occurs on narrow ridges, generally near the head of natural waterways, where the slopes are from 50 to 100 feet in length. Only from 3 to 7 inches of the original surface layer remains. The present plow layer generally consists of a mixture of subsoil and the remaining surface soil and is less porous than that of Muren silt loam, 2 to 7 percent slopes. Also, surface runoff is more rapid than on the less sloping soil, and the hazard of erosion is more serious.

This soil is suitable for crops if erosion is adequately controlled, and it can be used for pasture or woodland. The major problems are control of erosion and maintenance of fertility. (Management group IIIe–1; fruit and vegetable group 2)

Muren soils, 7 to 12 percent slopes, severely eroded (453D3).—These soils occur near the head of draws and on the side slopes of valleys. Less than 3 inches of the original surface layer remains. The present plow layer consists mostly or, in some places, entirely of subsoil material, and the texture is heavy silt loam or silty clay loam. Surface runoff is rapid, and the hazard of further erosion is serious. Included in mapping were small areas where the surface layer is more than 7 inches thick.

These soils are suitable for limited cultivation, and they can be used for pasture and woodland. The major problems are controlling erosion, increasing fertility, and increasing the organic-matter content. (Management group IVe–1; fruit and vegetable group 2)

Muren silt loam, 12 to 18 percent slopes, eroded (453E2).—This soil occurs on hillsides and near the head of drainageways. Ordinarily, the surface layer is from 3 to 7

inches thick. Included in mapping, however, were some areas where the surface layer is more than 7 inches thick, and others where it is less than 3 inches thick. The present surface layer generally is a mixture of subsoil and the remaining surface soil. Surface runoff is rapid, and the hazard of further erosion is serious.

This soil is used mostly for pasture or woodland. It is suitable for limited cultivation if erosion is controlled. (Management group IVe–1; fruit and vegetable group 3)

Muren soils, 12 to 18 percent slopes, severely eroded (453E3).—These soils are along drainageways where the slopes are from 50 to 100 feet long and on hillsides where the slopes are from 100 to 200 feet long. Less than 3 inches of the original silty surface layer remains. The present plow layer consists almost entirely of subsoil material. It is yellowish-brown heavy silt loam or silty clay loam. Gullies have formed in some areas. Surface runoff is rapid, and the hazard of further erosion is serious.

These soils, for the most part, have been heavily cropped, but many areas are now idle. They are not suitable for crops but can be used for pasture or woodland. Control of erosion and maintenance of fertility are the major problems if these soils are used for pasture. (Management group VIe–1; fruit and vegetable group 3)

Muren soils, 18 to 30 percent slopes, severely eroded (453F3).—These soils are on steep side slopes 100 to 200 feet or more in length. Less than 7 inches of the original surface layer remains, and on three-fourths of the acreage there is less than 3 inches. The present surface layer consists mostly or, in some places, entirely of subsoil material. Gullies have formed in some areas, and in places erosion has cut deeply into the subsoil or into the substratum. Surface runoff is very rapid, and the hazard of further erosion is serious. Included in mapping were a few small areas of Muren soils on short slopes that have a gradient of more than 30 percent.

Most of this acreage has been used for crops, but many areas are now idle or in brushy pasture. These soils are suitable for woodland or for limited use as pasture. If they are used for pasture, the major problems are controlling erosion and increasing fertility. (Management group VIe–1; fruit and vegetable group 3)

Newart Series

In the Newart series are somewhat poorly drained, moderately dark colored soils that formed in silty sediments 30 to 50 inches thick over sandy sediments. These sediments were deposited by the Mississippi River. These soils are on level or very gently sloping bottom lands along the Mississippi River.

Representative profile of Newart silt loam:

- 0 to 7 inches, very dark gray, friable silt loam; granular structure.
- 7 to 38 inches, very dark grayish-brown to dark grayish-brown, friable silt loam mottled with brown to pale brown; blocky structure.
- 38 to 60 inches, light brownish-gray to yellowish-brown fine sandy loam.

The Newart soils are moderately or moderately rapidly permeable and have high available moisture capacity. The reaction is nearly neutral, and little or no lime is needed. Fertility is high, and the response to treatment is good.

Newart silt loam (0 to 2 percent slopes) (161).—This soil occurs mostly in level areas or on slopes of less than 2 percent. Included in mapping were about 100 acres where the slope ranges from 2 to 7 percent. Also included were small areas where the texture is silt loam or loam to a depth of more than 50 inches. Other small inclusions consist of soils that have thin lenses of silty clay loam or sandy loam above a depth of 30 inches; soils that have a layer of silt loam, silty clay loam, or silty clay below a depth of 50 inches; soils that have alternating silt loam and fine sandy loam layers to a depth greater than 50 inches; and soils in which the depth to the sandy sediments is slightly less than 30 inches. The number and variety of inclusions result from the variability and the high degree of stratification of the Mississippi alluvium.

The Newart soil is well suited to crops and generally is used for this purpose. It is also well suited to pasture and woodland. In level areas the water table normally is high for short periods, and drainage may be needed. Erosion is a slight hazard in the more sloping areas. Maintenance of fertility and maintenance of the organic-matter content are minor problems. Areas not protected by levees are subject to flooding. (Areas protected by levees are in management group I–3, areas not protected are in management group IIw–5; fruit and vegetable group 12)

Okaw Series

The Okaw series consists of poorly drained, light-colored soils that formed in silt loam material over silty clay to clay deposited by the ancient Ohio River. These soils occur mainly in level areas on low terraces in the Cache River valley. They are most common in the vicinity of Tamms and Unity.

Representative profile of Okaw silt loam:

- 0 to 6 inches, dark grayish-brown, friable silt loam; granular structure.
- 6 to 12 inches, grayish-brown, friable silt loam; platy structure.
- 12 to 40 inches, grayish-brown, very firm silty clay mottled with yellowish brown and strong brown; blocky structure.
- 40 to 60 inches, grayish-brown, firm silty clay mottled with dark yellowish brown.

The Okaw soils are very slowly permeable and have moderate available moisture capacity. They are wet in spring and droughty late in summer. Natural fertility is low, and the reaction is very strongly acid. The response to additions of lime and fertilizer is somewhat unsatisfactory because of the fine-textured subsoil and poor drainage.

Okaw silt loam (0 to 1 percent slopes) (84).—The silt loam surface layer ranges from 7 to 24 inches in thickness but generally is from 12 to 18 inches thick. Where the surface layer is 18 to 24 inches thick, this soil has slightly higher available moisture capacity and is slightly more productive than is typical for the Okaw soils. In the vicinity of Horseshoe Lake Park, there are eight areas, totaling about 200 acres, in which medium-textured sediments occur below the silty clay subsoil, or at a depth of about 40 inches. These areas are slightly better drained than are most areas of the Okaw soils.

Although droughty, this soil is suited to crops, pasture, or woodland. The major problems are to provide adequate drainage, to maintain fertility, and to maintain the organic-matter content. (Management group IIIw–2; fruit and vegetable group 6)

Okaw silty clay loam (0 to 1 percent slopes) (401).—In most areas of this soil the surface layer is moderately fine

textured, and the silty clay layer is at a depth of only 8 to 15 inches. In some areas, however, the surface layer consists of 2 to 5 inches of silt loam. If this material is mixed with the underlying finer textured material in cultivation, the plow layer is heavy silt loam or light silty clay loam. This soil has a slower rate of infiltration and lower available moisture capacity than Okaw silt loam. It is also wetter in spring and is more difficult to keep in good tilth.

This soil is somewhat better suited to pasture and woodland than to crops. It can be used to a limited extent for crops, but the response to fertilizer and other good management is low, and many areas are left idle. The major problems are to provide adequate drainage and to maintain fertility and tilth. (Management group IVw–1; fruit and vegetable group 6)

Petrolia Series

The Petrolia series consists of poorly drained or very poorly drained, light-colored soils that formed in slightly acid or neutral silty clay loam sediments more than 40 inches thick. These sediments were deposited principally by floodwaters from the Ohio River.

Representative profile of Petrolia silty clay loam:

0 to 7 inches, grayish-brown silty clay loam mottled with yellowish brown and dark gray; granular structure.
7 to 19 inches, dark-gray silty clay loam mottled with yellowish brown and gray; medium and coarse blocky structure.
19 to 50 inches, gray silty clay loam mottled with yellowish brown and light olive brown.

The Petrolia soils are moderately slowly permeable and have high available moisture capacity. The water table is high during wet periods. These soils are only slightly acid and are medium in natural fertility. The response to treatment is good.

Petrolia silty clay loam (0 to 1 percent slopes) (288).—This soil occurs mostly in wide nearly level areas. Northeast and southwest of Mound City, adjacent to the Ohio River, are eight areas, totaling a little more than 460 acres, where the surface layer is brown and is neutral in reaction. This layer is underlain at a depth of 10 to 20 inches by a strongly acid or very strongly acid gray layer. Also included in mapping were about 150 acres of a Petrolia soil that has from 8 to 20 inches of silt loam overwash deposited on the original surface soil, and some small areas of Piopolis soils. These included soils can be used and managed in the same way as Petrolia silty clay loam.

This soil is suited to crops, pasture, or woodland. The major problems are providing adequate drainage, providing protection from overflow, and maintaining fertility and tilth. (Management group IIw–4; fruit and vegetable group 14)

Petrolia silty clay loam, wet (0 to 1 percent slopes) (W288).—This soil is flooded or has a high water table too late in spring for cultivated crops to be grown. Some areas are swampy and remain wet or ponded most of the year.

At the present time, this soil is suited only to woodland or, where not extremely wet, to pasture. If drainage is feasible and an adequate system is installed, this soil can be used for crops. Included in mapping were small areas of Piopolis soils. (Management group Vw–1; fruit and vegetable group 15)

Piopolis Series

The Piopolis series consists of poorly drained or very poorly drained light-colored soils that formed in medium acid or strongly acid silty clay loam sediments more than 40 inches thick. These sediments were deposited principally by floodwaters from the Ohio River.

Representative profile of Piopolis silty clay loam:

0 to 7 inches, grayish-brown, firm silty clay loam mottled with strong brown and yellowish brown; granular structure.
7 to 44 inches, gray, firm silty clay loam mottled with strong brown to yellowish brown; medium to coarse, blocky structure.
44 to 60 inches, gray light silty clay mottled with dark yellowish brown and strong brown.

The Piopolis soils are slowly permeable and have high available moisture capacity. The water table is high during wet periods. The reaction is strongly acid, and natural fertility is low. The response to treatment is moderate.

Piopolis silty clay loam (0 to 1 percent slopes) (420).—This soil occurs principally in broad level or nearly level areas and depressions. Included in mapping were a few areas of a somewhat poorly drained soil that has a surface layer of light-colored silty clay loam, and several areas where the surface layer consists of 8 to 20 inches of silt loam or heavy silt loam. In many places there is a silty clay layer below a depth of 40 inches.

This soil is suited to crops, pasture, or woodland. The major problems are providing adequate drainage, providing protection from flooding, and maintaining fertility and tilth. (Management group IIIw–5; fruit and vegetable group 14)

Piopolis silty clay loam, wet (0 to 1 percent slopes) (W420).—This soil is flooded or has a high water table too late in spring to permit the preparation of seedbeds and the planting of cultivated crops. In some areas between Ullin and Tamms, there is an overwash of light-colored silt loam, 8 to 20 inches thick, on the original surface soil.

This soil is used principally for woodland, but it is also suitable for pasture. It can be used for crops if properly drained and protected from overflow. (Management group Vw–1; fruit and vegetable group 15)

Racoon Series

The Racoon series consists of poorly drained, light-colored soils that formed in medium-textured alluvial material deposited by the Ohio River. These soils have a silt loam surface layer more than 24 inches thick. They are on level terraces along the Cache River.

Representative profile of Racoon silt loam:

0 to 6 inches, dark grayish-brown and grayish-brown, friable silt loam; granular structure.
6 to 28 inches, grayish-brown, friable silt loam mottled with yellowish brown; platy structure.
28 to 50 inches, gray, firm silty clay loam or silty clay mottled with yellowish brown; blocky structure.
50 to 60 inches, gray, friable silty clay loam to clay loam mottled with yellowish brown.

The Racoon soils are slowly permeable and have a high water table during wet periods. The available moisture capacity is moderate but generally is not adequate for best crop growth during dry periods. These soils are acid and are low in natural fertility. The response to treatment is moderate.

Racoon silt loam (0 to 2 percent slopes) (109).—This soil is in broad nearly level areas. Included in mapping were some areas where the surface layer is loam or very fine sandy loam.

Although droughty, this soil is suited to general crops. It is also suited to pasture or woodland. The major problems are providing adequate drainage and maintaining fertility. (Management group IIIw–2; fruit and vegetable group 6)

Riley Series

In the Riley series are somewhat poorly drained, moderately dark colored soils that formed in silty clay loam sediments 15 to 30 inches thick over sandy sediments. These soils are in broad level areas and on gently sloping or moderately sloping ridges on bottom lands along the Mississippi River.

Representative profile of Riley silty clay loam:

- 0 to 5 inches, very dark grayish-brown, firm silty clay loam; granular structure.
- 5 to 15 inches, very dark gray, firm silty clay loam; blocky structure.
- 15 to 24 inches, brown, friable silt loam to loam; many, faint, pale-brown mottles; blocky structure.
- 24 to 50 inches, light brownish-gray, friable fine sandy loam; massive; commonly stratified below a depth of about 50 inches with thin layers of fine sand to clay loam.

The Riley soils are moderately permeable in the upper layers and rapidly permeable in the coarser textured underlying material. The available moisture capacity is moderate, because of the underlying fine sandy loam. The water table generally is high in winter and in spring, but during the growing season crops may be damaged because of the lack of moisture. Surface runoff is slow or medium. These soils are nearly neutral in reaction and are medium in fertility. The response to treatment is good.

Riley silty clay loam, 0 to 2 percent slopes (452A).—In most areas the silty clay loam surface layer is 15 to 30 inches thick. Included in mapping, however, were areas totaling about 180 acres where the surface layer is less than 15 inches thick and the soil is more droughty than the thicker soil. Also included were a few areas that are wet or ponded for long periods of time, and an area in which an overwash of fine sandy loam covers the original surface layer.

This soil is used mainly for crops, but it is also suited to pasture or woodland. Droughtiness is the major limitation, but this soil is also subject to overflow if not protected by levees. (Management group IIs–2; fruit and vegetable group 13)

Riley silty clay loam, 2 to 4 percent slopes (452B).—This soil is on short slopes and on undulating bottom lands. It is subject to erosion. Nevertheless, on about two-thirds of the acreage the surface layer is still more than 15 inches thick. On the rest it is thinner, and the soil is more droughty than the thicker soil. Continued loss of surface soil will bring the fine sandy loam layer closer to the surface and cause this soil to become more droughty.

This soil commonly is used for crops, but it is also suited to pasture and woodland. Droughtiness is the main limiting factor. Protection from overflow and control of erosion are major problems. (Management group IIs–2; fruit and vegetable group 13)

Riley silty clay loam, 4 to 7 percent slopes (452C).—This soil is on the banks of sloughs and on gently rolling bottom lands. It is subject to erosion. On about three-fourths of the acreage, the silty clay loam surface layer is less than 14 inches thick, and the soil is more droughty than where it is uneroded. Continued loss of surface soil will bring the fine sandy loam layer closer to the surface and cause this soil to become more droughty. Included in mapping were a few areas where the slope is stronger than 7 percent.

This soil commonly is used for cultivated crops, but it is also suited to pasture and woodland. Droughtiness is the main limiting factor. Control of erosion and protection from flooding are major problems. (Management group IIs–2; fruit and vegetable group 13)

Roby Series

The Roby series consists of somewhat poorly drained, light-colored soils that formed in sandy alluvial material deposited by the Ohio River. These soils are on level to gently sloping low terraces, principally in the vicinity of Ullin, Tamms, and Unity.

Representative profile of Roby fine sandy loam:

- 0 to 7 inches, dark grayish-brown, friable fine sandy loam; granular structure.
- 7 to 18 inches, grayish-brown to brown, friable fine sandy loam mottled with yellowish brown; granular structure.
- 18 to 30 inches, brown, friable loam to sandy clay loam mottled with grayish brown and dark yellowish brown; blocky structure.
- 30 to 60 inches, light brownish-gray to grayish-brown, friable fine sandy loam to loamy fine sand mottled with dark yellowish brown and yellowish brown.

The texture of the subsoil and substratum varies considerably. The subsoil ranges from loam to clay loam, and the substratum is stratified with thick to thin layers of loamy fine sand to silty clay.

Although these soils are moderately permeable, the water table in level areas generally is high during wet periods. In normal seasons the supply of available moisture is not adequate for best crop growth. These soils are acid and are low in natural fertility. Nevertheless, the response to treatment is good.

Roby fine sandy loam, 0 to 2 percent slopes (184A).—This soil generally has a high water table during wet periods. Included in mapping were a few areas where an overwash of light-colored silt loam has covered the original surface layer. Also included were many areas where the surface layer is loam or very fine sandy loam.

Although droughty, this soil is suited to crops, pasture, and woodland. The major problems are maintenance of fertility and maintenance of the organic-matter content. (Management group IIs–1; fruit and vegetable group 5)

Roby fine sandy loam, 2 to 4 percent slopes (184B).—This soil is on narrow ridges or on side slopes of terraces. The slopes are from 30 to 80 feet long. In many areas this soil is slightly eroded. Included in mapping were some areas of the poorly drained Ruark soils that have a slope range of 2 to 4 percent. Also included were many areas where the surface layer is loam or very fine sandy loam.

Although droughty, this soil is suitable for crops, pasture, or woodland. The major problems are control of erosion, maintenance of fertility, and maintenance of the organic-matter content. (Management group IIe–3; fruit and vegetable group 5)

Ruark Series

The Ruark series consists of poorly drained, light-colored soils that formed in sandy alluvial material deposited by the Ohio River. These soils are on level low terraces along the Cache River, principally in the vicinity of Ullin, Tamms, and Unity.

Representative profile of Ruark fine sandy loam:

0 to 7 inches, grayish-brown, friable fine sandy loam mottled with yellowish brown; granular structure.
7 to 18 inches, light brownish-gray, friable fine sandy loam mottled with brownish yellow; massive.
18 to 33 inches, gray, friable clay loam mottled with light gray, brownish yellow, and yellowish brown; blocky structure.
33 to 37 inches, light-gray, friable sandy clay loam to loam mottled with grayish brown and yellowish brown; blocky structure.
37 to 60 inches, light-gray to light brownish-gray stratified layers of sand, silt, and clay mottled with yellowish brown.

The Ruark soils are slowly permeable. The water table is high during wet periods. During dry periods the supply of available moisture is not adequate for good plant growth. The reaction is acid, and natural fertility is low. The response to treatment is fair.

Ruark fine sandy loam (0 to 3 percent slopes) (178).—Most of this soil is level or nearly level, but a few areas have a gradient of 1 to 3 percent. The fine sandy loam surface layer generally is from 20 to 24 inches thick, but it ranges to as much as 30 inches in thickness. The texture of the surface layer varies and in some areas is loam or very fine sandy loam. The subsoil and substratum also vary considerably in texture. The subsoil is typically clay loam, but in many areas it is sandy clay loam or loam. The substratum generally is stratified loamy fine sand to silty clay. Included in mapping were six small areas that have a dark-colored surface layer.

Although droughty, this soil is suited to crops, pasture, or woodland. The major problems are maintenance of fertility and maintenance of the organic-matter content. (Management group IIIw–2; fruit and vegetable group 6)

Sarpy Series

In the Sarpy series are well-drained to excessively drained, light-colored, calcareous soils that formed in more than 40 inches of loamy fine sand or fine sand deposited by the Mississippi River. These soils are on low ridges, in level areas, and on short breaks near or adjacent to the Mississippi River.

Representative profile of Sarpy loamy fine sand:

0 to 10 inches, dark-brown, friable loamy fine sand.
10 to 60 inches, yellowish-brown, loose loamy fine sand or fine sand.

The Sarpy soils are rapidly permeable, and they have a low available moisture capacity. Air and water move readily through the sandy soil material. Natural fertility is low, and productivity is low even if management is good. Sloping areas have slow surface runoff and are not affected by water erosion, but all areas are subject to wind erosion if not protected by vegetation.

Sarpy loamy fine sand (1 to 10 percent slopes) (92).—About three-fourths of the acreage occurs on level to undulating ridges, on old natural levees, or in long narrow areas that have a slope of 1 to 4 percent. The rest is in areas that have a slope of as much as 10 percent. These more strongly sloping areas occur as narrow breaks, 20 to 40 feet wide, along the sides of ridges. In these areas this soil is likely to be more droughty than it is in the other areas. Thin bands or lenses of silty material commonly occur at various depths in the soil profile.

Although droughty, this soil is suited to woodland or pasture, and it can be used to a limited extent for crops. The major problems are protection from overflow and maintenance of fertility. Control of erosion is a problem in areas not protected by vegetation. (Management group IVs–1; fruit and vegetable group 8)

Sciotoville Series

The Sciotoville series consists of moderately well drained, light-colored soils that formed in medium-textured alluvial material deposited by the ancient Ohio River. In some places there is a weakly to moderately well developed fragipan. These soils are in level areas, on low ridges, and on short side slopes of terraces along the Cache River.

Representative profile of Sciotoville silt loam:

0 to 8 inches, dark-brown, friable silt loam; granular structure.
8 to 13 inches, brown, friable silt loam; granular structure.
13 to 35 inches, yellowish-brown to brown silty clay loam mottled with strong brown and yellowish red in the lower part; blocky structure.
35 to 50 inches, mottled pale-brown and yellowish-red stratified layers of silt loam to silty clay loam and some sand.

The Sciotoville soils are moderately slowly permeable and have high available moisture capacity. They are moderately erodible. The reaction is acid, and natural fertility is low, but the response to treatment is good.

Sciotoville silt loam, 0 to 2 percent slopes (462A).—Ordinarily, the silt loam surface layer is more than 7 inches thick, but in a few areas southwest of Mounds, it is less than 7 inches thick. Near Tamms, Ullin, and Unity, where the Sciotoville soils are associated with the Alvin soils, are some included areas where the surface layer is loam or very fine sandy loam. Normally, the subsoil is silty clay loam or light silty clay, but in some areas where this soil is closely associated with the Alvin soils, the subsoil is loam. The stratified materials in the substratum are dominantly fine sandy loam and silt loam.

This soil is well suited to crops and is used mainly for this purpose. It is also suited to pasture or woodland. There are no major problems, but maintenance of fertility is a minor problem. (Management group IIw–1; fruit and vegetable group 4)

Sciotoville silt loam, 2 to 4 percent slopes (462B).—This soil generally occurs on low narrow terrace ridges, where the slopes are from 50 to 150 feet long. In most areas only 7 to 14 inches of the original silt loam surface layer remains. Included in mapping were some areas, totaling about 90 acres, where the silt loam surface layer is less than 7 inches thick. Also included in mapping are some areas where the surface layer is loam or very fine sandy loam. These areas are near Tamms, Ullin, and Unity, where the Sciotoville soils are associated with the Alvin soils. Normally, the subsoil is silty clay loam or light silty clay, but in places where this soil is closely associated with the Alvin soils, it is loam.

This soil is well suited to crops if simple erosion control practices are used. It is also suited to pasture or woodland.

The major problems are maintenance of fertility and control of erosion. (Management group IIe–1; fruit and vegetable group 4)

Sciotoville silt loam, 4 to 7 percent slopes, eroded (462C2).—This soil occurs on narrow terrace ridges and on side slopes. The slopes generally are from 50 to 100 feet long. Only 3 to 7 inches of the original silt loam surface layer remains. The present plow layer is a mixture of the finer textured subsoil and the remaining surface soil. It is more yellow and less porous than that of the uneroded Sciotoville soils. Included in the areas mapped are some areas where more than 7 inches of the original silt loam surface layer remains and some areas of a more highly mottled soil. Near Tamms, Ullin, and Unity, where Sciotoville soils are associated with the Alvin soils, are some included areas where the surface layer is loam or very fine sandy loam. Normally, the subsoil is silty clay loam or light silty clay, but in some areas where this soil is closely associated with the Alvin soils, the subsoil is loam.

This soil is used principally for crops, but it is also suited to pasture and woodland. Erosion is a moderate hazard. Maintenance of fertility is a minor problem. (Management group IIe–1; fruit and vegetable group 4)

Sciotoville soils, 4 to 7 percent slopes, severely eroded (462C3).—These soils occur in small areas, mainly on short breaks at the edge of terraces. Less than 3 inches of the original silt loam surface layer remains. The present plow layer consists mostly of silty clay loam, formerly subsoil, and it is less friable and less porous than the surface layer of the less eroded Sciotoville soils. In addition, surface runoff is more rapid, and the hazard of erosion is greater. Included in mapping were some steep and severely eroded areas of the well-drained Wheeling soils and the somewhat poorly drained Weinbach soils. Some areas where the surface layer is loam or very fine sandy loam were included in the areas mapped near Tamms, Ullin, and Unity, where Sciotoville soils are associated with the Alvin soils. The subsoil normally is silty clay loam or silty clay, but in some places where this soil is closely associated with the Alvin soils, the subsoil is loam.

These soils are suited to crops, pasture, and woodland. They generally are used in the same way as surrounding soils. The major problems are control of erosion, maintenance of fertility, and maintenance of the organic-matter content. (Management group IIIe–1; fruit and vegetable group 4)

Sciotoville silt loam, 7 to 12 percent slopes, eroded (462D2).—This soil occurs on the short side slopes of stream terraces. Only from 3 to 7 inches of the original silt loam surface layer remains. The present plow layer contains finer textured material from the subsoil and is more yellow and less porous than the surface layer of the less eroded Sciotoville soils. Some areas in which more than 7 inches of the original surface layer remains were included in mapping. Also included were some moderately eroded areas of the somewhat poorly drained Weinbach soils and the well-drained Wheeling soils. Near Tamms, Ullin, and Unity, where the Sciotoville soils are associated with the Alvin soils, are some included areas where the surface layer is loam or very fine sandy loam. Normally, the subsoil is silty clay loam or silty clay, but in some places where this soil is closely associated with the Alvin soils, the subsoil is loam.

This soil is suited to crops, pasture, or woodland. The major problem is control of erosion. A minor problem is maintenance of fertility. (Management group IIIe–1; fruit and vegetable group 4)

Sciotoville soils, 7 to 12 percent slopes, severely eroded (462D3).—These soils are on the short side slopes of stream terraces. Less than 3 inches of the original silt loam surface layer remains. The present plow layer consists mostly of silty clay loam and is less friable and less porous than that of the less eroded Sciotoville soils. Surface runoff is rapid, and the hazard of erosion is serious. Included in mapping were small areas of the Weinbach and Wheeling soils that are severely eroded. Also included were some areas where the surface layer is loam or very fine sandy loam. These areas are near Tamms, Ullin, and Unity, where the Sciotoville soils are associated with the Alvin soils. Normally the subsoil is silty clay loam or light silty clay, but in some places where this soil is closely associated with the Alvin soils, the subsoil is loam.

This soil is suited to pasture or woodland, and it can be used to a limited extent for crops. The major problems are control of erosion, maintenance of fertility, and maintenance of the organic-matter content. (Management group IVe–1; fruit and vegetable group 4)

Sharon Series

The Sharon series consists of moderately well drained or well drained, light-colored soils that formed in medium acid or strongly acid sediments more than 40 inches thick. The sediments were derived from nearby loess-covered uplands. These soils occur as small and medium-sized areas of bottom lands in Pulaski County.

Representative profile of Sharon silt loam:

0 to 11 inches, brown to yellowish-brown, friable silt loam; granular structure.

11 to 50 inches, dark yellowish-brown to yellowish-brown, friable silt loam mottled in the lower part with pale brown and light yellowish brown.

The Sharon soils are moderately permeable and have high available moisture capacity. They are acid and are medium in natural fertility. The response to treatment is good.

Sharon silt loam (0 to 4 percent slopes) (72).—This soil occurs mainly on small, narrow, nearly level or gently sloping bottom lands. Ordinarily, the surface is somewhat rounded. The slope generally ranges from 2 to 4 percent, but in a few fan-shaped areas, it is more than 4 percent. In many areas this soil contains considerable sand or thin layers of loamy or sandy material. In places there is some gravel. Included in mapping were small areas where the soil is only slightly acid.

This soil is well suited to crops, pasture, or woodland. There are no major problems, but minor problems are maintenance of fertility and protection from occasional overflow. (Management group I–2; fruit and vegetable group 9)

Stookey Series

The Stookey series consists of light-colored, well-drained soils that formed in 50 or more inches of loess that generally overlies massive beds of chert. In a few local areas, the loess overlies limestone, and in an area near Fayville,

it overlies Coastal Plain gravel. These soils are on uplands in Alexander County, generally on slopes of more than 15 percent.

Representative profile of a forested Stookey silt loam:

0 to 3 inches, very dark grayish-brown, friable silt loam; granular structure.
3 to 6 inches, yellowish-brown and dark grayish-brown, friable silt loam; platy structure.
6 to 13 inches, dark yellowish-brown to strong-brown, friable silt loam; blocky structure.
13 to 30 inches, strong-brown to yellowish-red, friable to slightly firm silt loam; blocky structure.
30 to 50 inches, strong-brown, friable silt loam; massive.

The depth to bedrock varies, depending on the steepness of the slope and the amount of erosion.

The Stookey soils are moderately permeable, and they have moderate or rapid surface runoff. The available moisture capacity generally is not adequate for best plant growth. These soils are medium in inherent fertility and are medium or strongly acid. They are readily eroded unless protected by vegetation.

Stookey silt loam, 12 to 18 percent slopes (216E).—This soil is of minor extent. It occurs in small areas at the head of drainageways, in long thin bands at the foot of steeper slopes, or on hillsides. In most areas more than 7 inches of the original surface layer remains. Included in the areas mapped, however, are some eroded areas where the surface layer is less than 7 inches thick. Also included are some areas in which some sand, gravel, or stones are mixed with the soil material.

This soil can be used for limited cultivation if erosion is adequately controlled, but it is better suited to pasture or woodland. The major problems are control of erosion and maintenance of fertility. (Management group IVe–1; fruit and vegetable group 3)

Stookey silt loam, 18 to 30 percent slopes (216F).—This soil occurs on steep hillsides, on rims between the ridges and the rocky lower part of slopes, and on steep foot slopes. More than 7 inches of the original surface layer remains. Surface runoff is moderate, but the hazard of erosion is serious if the forest cover is removed.

Most of this soil is forested. Those areas that have been cleared are used for pasture. If this soil is used for pasture, the major problems are control of erosion and maintenance of fertility. (Management group VIe–1; fruit and vegetable group 3)

Stookey silt loam, 18 to 30 percent slopes, severely eroded (216F3).—This soil occurs in moderately steep areas where attempts to cultivate the soil have caused erosion. The remaining surface layer is less than 3 inches thick and generally is brown to yellowish brown in color. Deep gullies have formed on more than half of the acreage, and several small areas are severely gullied. Surface runoff is rapid, and further erosion is a serious hazard if this soil is not kept in permanent vegetation.

This soil can be used for woodland or for limited pasture. (Management group VIe–1; fruit and vegetable group 3)

Stookey silt loam, 30 to 50 percent slopes (216G).—This soil occurs on very steep side slopes that are from 200 to 500 feet long. Most of the acreage is forested, and more than 7 inches of the original surface layer remains. Surface runoff is rapid, however, and the hazard of erosion is serious if the forest cover is removed. This soil is likely to have more weakly developed horizons than the soil described as representative of the series, and there are more inclusions of the Bodine soils. In some areas along the Mississippi River bluffs, mainly east of McClure, either the surface layer consists of calcareous silty material or calcareous silty material occurs within 40 inches of the surface. These calcareous areas are under a cover of grass, or they have only a sparse cover of shrubby trees. Included in mapping were a few areas of the Alford soils, which have a silty clay loam subsoil. These areas, which make up about 130 acres, are slightly to severely eroded and have slopes of 30 to 45 percent.

Almost all of this soil is forested and should remain in forest. The steep slopes present a slight problem in the harvesting of timber. (Management group VIIe–1; fruit and vegetable group 3)

Stookey-Bodine complex, 18 to 30 percent slopes (990F).—These soils are mapped together because it was not practical to show them separately on maps of the scale used. The Stookey soils occupy the upper part of steep slopes, and the Bodine soils occupy the lower part. The Stookey soils make up from 50 to 85 percent of the area, and the Bodine soils make up the rest. The Bodine soils occupy a larger proportion of the areas in coves than of those on spurs. Within a particular area, the Bodine soils generally are steeper than the Stookey.

The Stookey soils have a profile similar to the one described as representative of the series. The Bodine soils developed in less than 20 inches of loess over chert bedrock. Part, and in places all, of the Bodine soil material is a mixture of loess and chert.

This complex is widely distributed throughout Alexander County. One area occurs west of Wetaug in Pulaski County. Generally, more than 3 inches of the original surface layer remains, but north of Elco there are four areas that have been cleared of trees and consequently are severely eroded.

These soils occur on slopes that are from 100 to 400 feet in length. Surface runoff is very rapid, and the hazard of erosion is high. Most of the acreage is wooded, but a few areas are used for pasture. Steepness, stoniness, and droughtiness are limiting factors. The major problem is control of erosion. (Management group VIIs–1; fruit and vegetable group 3)

Stookey-Bodine complex, 30 to 60 percent slopes (990G).—These soils are mapped together because it was not practical to show them separately on maps of the scale used. The Stookey soils occupy the upper part of steep slopes, and the Bodine soils occupy the lower part. The Stookey soils make up 50 to 85 percent of the area, and the Bodine soils make up the rest. The Bodine soils occupy a larger proportion of the areas in coves than of those on spurs. In coves, the slope commonly is more than 60 percent.

The Stookey soils have a profile similar to the one described as representative of the series. The Bodine soils developed in less than 20 inches of loess over chert bedrock. Part, and in places all, of the Bodine soil material is a mixture of loess and chert.

Large areas of these soils are widely distributed throughout the uplands of Alexander County. Included in mapping were some areas of the Alford soils, which occur on narrow ridges generally less than 30 feet wide. Also included were small areas of silty alluvial soils along narrow drainageways.

In a few areas these soils are underlain by Coastal Plain

gravel, sand, and clay, instead of chert. There is about 300 acres near Fayville where the soils are underlain mainly by gravel and sand. These materials crop out in an indefinite pattern on the lower part of slopes, in coves, on the upper part of slopes, and on ridgetops. They are a source of sand at Fayville. North of Olmsted in Pulaski County, there are about 250 acres where the underlying material is mainly clay and sand. The fullers earth mined at Olmsted represents this clay, which crops out on the lower part of slopes. Slippage occurs at the contact of this clay with the overlying loess and is a hazard in engineering work. West of Mounds, Coastal Plain gravel crops out on the lower part of slopes.

These soils generally occur on slopes that are from 200 to 500 feet in length. Nearly all areas are wooded and should remain wooded. The hazard of erosion is severe. Steepness is a limiting factor in the use of equipment to harvest trees. Stoniness and droughtiness are also limitations. (Management group VIIs–1; fruit and vegetable group 3)

Stoy Series

The Stoy series consists of light-colored, somewhat poorly drained soils that formed in silty material that is no less than 40 inches thick and in most places is more than 100 inches. These soils are in broad, gently sloping or moderately sloping areas and on short side slopes along drainageways, mostly in Pulaski County.

Representative profile of Stoy silt loam:

0 to 11 inches, dark grayish-brown, friable silt loam; granular structure.
11 to 21 inches, yellowish-brown, friable silt loam; platy structure in upper part, blocky structure in lower part.
21 to 40 inches, grayish-brown, firm silty clay loam mottled with strong brown; blocky structure.
40 to 50 inches, gray, friable silt loam mottled with strong brown; massive.

In a few areas the substratum is alkaline. The depth to the alkaline substratum commonly is more than 60 inches but in some eroded areas is less than 40 inches.

The Stoy soils are slowly permeable and have slow or moderate surface runoff. The water table is near the surface during the wetter parts of the year. The available moisture capacity is moderate or high. These soils are naturally strongly acid and are low in fertility. The response to treatment is good.

Stoy silt loam, 0 to 2 percent slopes (164A).—This soil occurs mainly in areas 10 acres or less in size. It is used almost entirely for crops. The major problems are to provide adequate drainage and to maintain fertility. (Management group IIw–1; fruit and vegetable group 5)

Stoy silt loam, 2 to 4 percent slopes (164B).—Although this soil generally is slightly eroded, the remaining surface layer is more than 7 inches thick and in some places more than 14 inches. Some areas that are moderately eroded occur along drainageways. In these areas the surface layer is yellowish brown in color and is finer textured and less porous than that of the less eroded Stoy soils. Small areas of the poorly drained Weir soils at the head of drainageways were included in some of the areas mapped.

This soil is well suited to cultivated crops and pasture. The major problems are maintenance of fertility and disposal of excess water. Erosion is a slight hazard. (Management group IIw–1; fruit and vegetable group 5)

Tice Series

In the Tice series are moderately dark colored, somewhat poorly drained soils that formed in nearly neutral silty clay loam sediments more than 50 inches thick. These soils are in broad level areas and on gently sloping or moderately sloping ridges on bottom lands along the Mississippi River.

Representative profile of Tice silty clay loam:

0 to 20 inches, very dark grayish-brown, firm silty clay loam; blocky structure.
20 to 40 inches, dark-gray to very dark grayish-brown, firm silty clay loam mottled with dark yellowish brown; blocky structure.
40 to 60 inches, mixed gray, very dark grayish-brown, and dark yellowish-brown, friable silt loam; massive.

The Tice soils are moderately permeable and have high available moisture capacity. Surface runoff is slow, and the water table is near the surface for short periods during the wetter parts of the year. These soils are nearly neutral in reaction and are high in natural fertility. The response to treatment is good.

Tice silty clay loam, 0 to 2 percent slopes (284A).—This soil is in broad nearly level areas and in long narrow areas. It is associated with the Newart, Gorham, and Beaucoup soils. Included in mapping were some poorly drained soils in small depressions.

This soil is used mainly for cultivated crops but is also suited to pasture. It is subject to overflow if not protected by a levee. Where it is protected, there are no major problems. Minor problems are to provide adequate drainage and to maintain fertility and tilth. (Areas protected by levees are in management group I–3, areas not protected are in management group IIw–5; fruit and vegetable group 13)

Tice silty clay loam, 2 to 4 percent slopes (284B).—This soil is in undulating areas and on short gentle slopes. Some small areas in which fine sandy loam occurs at a depth of less than 50 inches were included in mapping. Also included were a few areas of Tice soils that have slopes of more than 4 percent.

This soil is used principally for cultivated crops, but it is also suited to pasture or woodland. Control of erosion is a minor problem. Other problems are protection from overflow and maintenance of tilth. (Management group IIe–4; fruit and vegetable group 13)

Tice silty clay, overwash (0 to 3 percent slopes) (284+).—This soil has from 8 to 24 inches of moderately dark colored silty clay overwash on the original silty clay loam surface layer. Below the silty clay overwash, it is similar to the soil described as representative of the series. This soil occurs in a single area in Dogtooth Bend where a relatively thin layer of silty clay has been deposited on the Tice soils. These sediments gradually become thick enough for the soils to be mapped as Darwin silty clay.

This soil is used almost entirely for crops. The major problems are protection from overflow and maintenance of tilth. (Management group IIw–5; fruit and vegetable group 14)

Wakeland Series

The Wakeland series consists of somewhat poorly drained, light-colored soils that formed in slightly acid or neutral silt loam sediments more than 40 inches thick.

The sediments were derived mainly from the very thick mantle of loess on nearby uplands. These soils are in small to large areas on bottom lands along streams that dissect the uplands in Alexander County.

Representative profile of Wakeland silt loam:

0 to 7 inches, brown, friable silt loam; granular structure.
7 to 19 inches, brown, friable silt loam mottled with grayish brown and light brownish gray; platy structure.
19 to 50 inches, brown, friable silt loam mottled with grayish brown, pale brown, and yellowish brown; platy structure in the upper part, massive in the lower part.

The Wakeland soils are moderately slowly permeable and have high available moisture capacity. The water table generally is high during very wet periods. These soils are only slightly acid and are medium in natural fertility. The response to treatment is good.

Wakeland silt loam (0 to 5 percent slopes) (333).—Most of this soil is level or nearly level. Some small areas of bottom lands have a gradient of 2 to 4 percent and slope from hillsides toward the stream. Some large areas are undulating and have slopes up to 5 percent. In places the surface layer tends to be coarser textured and approaches very fine sandy loam, particularly near the Mississippi River bluffs. In many areas chert pebbles occur in the soil material. Included in mapping were some small areas of soils that are medium acid or strongly acid.

The Wakeland soils are well suited to crops, pasture, or woodland. The major problems are to prevent overflow and streambank cutting, to provide drainage, to maintain fertility, and to maintain the organic-matter content. (Management group IIw–3; fruit and vegetable group 10)

Ware Series

The Ware series consists of moderately well drained or well drained, moderately dark colored soils that formed in silty sediments 10 to 30 inches thick over sandy sediments. These alluvial sediments were deposited by the Mississippi River. These soils are on bottom lands along the Mississippi River. They occur principally in level areas, but they also occur on low narrow ridges and on breaks from one level to another.

Representative profile of Ware silt loam:

0 to 12 inches, very dark grayish-brown, friable silt loam; granular structure.
12 to 23 inches, yellowish-brown, friable loam; blocky structure.
23 to 60 inches, yellowish-brown, loose fine sandy loam mottled with grayish brown in the lower part; single grain.

The Ware soils are moderately permeable in the upper layers and rapidly permeable in the more sandy layer. The available moisture capacity is likely to be a little too low for best plant growth, particularly if the silt loam surface layer is less than 14 inches thick. Surface runoff is slow, and in level, undrained areas the water table may be high during wet periods. The reaction is nearly neutral, and little or no lime is needed. Fertility is moderately high, and the response to treatment is good.

Ware silt loam, 0 to 2 percent slopes (456A).—In most areas the silt loam surface layer is from 14 to 30 inches thick. On about 150 acres, this layer is only 7 to 14 inches thick, and the soil is somewhat more droughty than in areas where the silty layer is thicker. Included in mapping were some areas where the surface layer is silt loam, loam, or very fine sandy loam and is from 10 to 30 inches thick. Normally, however, at least the uppermost 10 inches or more is silt loam, and the underlying layers are loam and fine sandy loam. In some places, the fine sandy loam is stratified with very fine sandy loam to silty clay loam, particularly below a depth of 40 to 50 inches.

Although droughty, this soil is well suited to crops, and where it is protected by levees, most of the acreage is cultivated. It is also suited to pasture or woodland. Protection from overflow and maintenance of fertility are problems. (Management group IIs–2; fruit and vegetable group 12)

Ware silt loam, 2 to 4 percent slopes (456B).—This soil occurs principally on low ridges or on old natural levees. It is susceptible to slight erosion. On about 140 acres the surface layer is only 7 to 14 inches thick. On the rest it is from 14 to 30 inches thick. Where the silty surface layer is thinner, this soil is slightly more droughty and is somewhat less productive than in other areas. Continued erosion will bring the sandy material closer to the surface and cause the soil to be more droughty. Included in mapping were some areas where the surface layer is silt loam, loam, or very fine sandy loam and is from 10 to 30 inches thick. Normally, however, the uppermost 10 inches or more is silt loam, and the underlying layers are loam and fine sandy loam. In some places the fine sandy loam layer is stratified with very fine sandy loam to silty clay loam, particularly below a depth of 40 to 50 inches. A few areas that slope more than 4 percent were also included in mapping.

Although droughty, this soil is suitable for crops, and almost all of the areas protected by levees are cultivated. It is also suitable for pasture or woodland. Protection from overflow is a major problem. Other problems are maintenance of fertility and control of erosion. (Management group IIs–2; fruit and vegetable group 12)

Weinbach Series

The Weinbach series consists of light-colored, somewhat poorly drained soils that formed in medium-textured alluvial material deposited by the ancient Ohio River. These soils are on low level ridges and on the short side slopes of terraces along the Cache River.

Representative profile of Weinbach silt loam:

0 to 8 inches, dark grayish-brown, friable silt loam; granular structure.
8 to 10 inches, light brownish-gray, friable silt loam mottled with grayish brown; platy structure.
10 to 14 inches, pale-brown, slightly firm heavy silt loam to light silty clay loam mottled with yellowish brown; blocky structure.
14 to 32 inches, pale-brown and yellowish-brown, very firm heavy silty clay loam to light silty clay streaked with gray; blocky structure.
32 to 42 inches, grayish-brown to light brownish-gray, very firm heavy silty clay loam; blocky structure.
42 to 60 inches, dark yellowish-brown and grayish-brown, firm silty clay loam; massive; stratified in places with layers of silt loam and fine sandy loam.

The Weinbach soils are slowly permeable and have moderately high available moisture capacity. In level areas the water table may be high during wet periods. These soils are acid and are low in natural fertility.

Weinbach silt loam, 0 to 2 percent slopes (461A).—This soil occurs in narrow to wide, level to very gently sloping areas. The silt loam surface layer ranges from 7 to 24 inches in thickness but in most places is between 16 and 20

inches thick. Normally, the surface layer is silt loam, but in some included areas near Tamms, Ullin, and Unity, where the Weinbach soils are associated with the Roby soils, the surface layer is loam or very fine sandy loam. In some of these included areas, the texture of the subsoil ranges to heavy loam or silt loam.

This soil is well suited to crops, and it generally is used for this purpose. It is also suited to pasture and woodland. The major problems are to provide adequate drainage and to maintain fertility. (Management group IIw–1; fruit and vegetable group 5)

Weinbach silt loam, 2 to 4 percent slopes (461B).—This soil is on low terrace ridges or on slopes along drainageways. The slopes are from 40 to 100 feet in length. This soil is slightly eroded, and it is likely to have a thinner surface layer than Weinbach silt loam, 0 to 2 percent slopes. In most areas the remaining surface layer is from 7 to 14 inches thick, and normally it is silt loam. Included in mapping, however, were some areas where the surface layer is loam or very fine sandy loam. These areas are near Tamms, Ullin, and Unity, where this soil is associated with the Roby soils. In some of these included areas, the subsoil ranges to heavy loam or silt loam. Also included in the areas mapped, principally along drainageways, are a few areas that are moderately eroded. In these areas, the remaining surface layer is from 3 to 7 inches thick, and the plow layer is a mixture of the finer textured subsoil and the remaining surface soil. Consequently, it is more yellow and less porous than that of the slightly eroded soil.

This soil is suited to crops, pasture, or woodland. The major problems are to provide adequate drainage, to control erosion, and to maintain fertility. (Management group IIw–1; fruit and vegetable group 5)

Weir Series

The Weir series consists of light-colored, poorly drained soils that formed in loess 80 to 200 inches thick. These soils have a claypan. They occur in nearly level areas in Pulaski County, mainly east of Mounds and south of New Grand Chain.

Representative profile of Weir silt loam:

0 to 9 inches, dark grayish-brown, friable silt loam; granular structure.
9 to 16 inches, light brownish-gray, friable silt loam; platy structure.
16 to 45 inches, grayish-brown, firm silty clay loam mottled with olive brown and light olive brown; blocky structure.
45 to 60 inches, grayish-brown, friable silt loam mottled with light olive brown and yellowish brown; massive.

The Weir soils are very slowly permeable and have slow surface runoff. Although they become wet and waterlogged in spring, they have only a moderate available moisture capacity because of the claypan, and they are slightly droughty during dry periods. They are strongly acid and are low in fertility. The response to treatment is moderate.

Weir silt loam (0 to 1 percent slopes) (165).—Included in mapping were a few small areas where the silt loam surface layer is less than 14 inches thick, and some areas where the slope is more than 2 percent. In some areas the substratum is alkaline at a depth of 60 to 80 inches.

Although droughty, this soil is productive of row crops, small grain, and hay if management is good. It is also suited to pasture and woodland. The major problems are to provide adequate drainage and to maintain fertility. (Management group IIIw–2; fruit and vegetable group 6)

Wheeling Series

The Wheeling series consists of light-colored, well-drained soils that formed in silty sediments deposited by the Ohio River. These soils occur on gently or moderately sloping terrace ridges along the Cache River.

Representative profile of Wheeling silt loam:

0 to 8 inches, dark grayish-brown, friable silt loam; granular structure.
8 to 10 inches, dark yellowish-brown, friable silt loam; granular structure.
10 to 45 inches, dark yellowish-brown, slightly firm silty clay loam; blocky structure.
45 to 50 inches, dark yellowish-brown, friable light silty clay loam mottled with strong brown; blocky structure.
50 to 60 inches, strong-brown, very friable silt loam to loamy fine sand; the underlying materials may be stratified or may be thick layers of silt loam, loam, or fine sandy loam.

The Wheeling soils are moderately permeable, and they have moderate to high available moisture capacity. They are naturally strongly acid and are medium in fertility. The response to treatment is good.

Wheeling silt loam, 0 to 2 percent slopes (463A).—This soil occurs on level to very gently sloping ridges. The surface layer is friable and porous, and it is more than 14 inches thick. Surface runoff is slow, and the hazard of erosion is slight. Included in mapping were small sandy areas and small areas of a less well drained soil.

This soil is well suited to crops, pasture, or woodland. There are no major problems, but maintenance of fertility is a minor problem. (Management group I–1; fruit and vegetable group 4)

Wheeling silt loam, 2 to 4 percent slopes (463B).—This soil occurs on gently sloping low ridges or on side slopes of terraces. The slopes generally are from 30 to 100 feet long. The surface layer is friable and porous, and it is more than 7 inches thick. Surface runoff is slow, and the hazard of erosion is slight. Included in mapping were small areas of a sandy soil and some areas where less than 7 inches of the original silt loam surface layer remains.

This soil is suited to crops, woodland, or pasture. The major problems are control of erosion and maintenance of fertility. (Management group IIe–1; fruit and vegetable group 4)

Wheeling silt loam, 4 to 7 percent slopes, eroded (463C2).—This soil occurs on side slopes of terraces and to a lesser extent on ridgelike narrow terraces. The slopes generally are from 30 to 100 feet long. From 3 to 7 inches of their original silt loam surface layer remains. The present surface layer is slightly finer textured and is less friable and porous than that of the slightly eroded Wheeling soils. Surface runoff is medium, and the hazard of erosion is moderate. Included in mapping were some small areas of a sandy soil and some areas where more than 7 inches of the original silt loam surface layer remains.

This soil is well suited to crops, pasture, or woodland. The major problems are control of erosion and maintenance of fertility. (Management group IIe–1; fruit and vegetable group 4)

Wheeling soils, 12 to 18 percent slopes, severely eroded (463E3).—These soils are on short steep side slopes of terraces along the Cache River. Ordinarily, they are

so severely eroded that less than 3 inches of the original surface layer remains, and in many places they are eroded into the subsoil. Included in mapping were a few areas where the surface layer is more than 3 inches thick. Also included were other terrace soils that have the same gradient and degree of erosion as these soils but are less well drained, or that are less permeable because of a heavy textured subsoil, or that are sandy. Also included were some areas that have a slope of more than 18 percent.

These soils are not suited to crops, but they are suitable for pasture or woodland. The major problems are control of erosion, maintenance of fertility, and maintenance of the organic-matter content. (Management group VIe–1; fruit and vegetable group 3)

Use and Management of the Soils

In this section, the capability classification of soils is explained, then the management of the soils, by groups, is discussed. Next, general management of cultivated soils is suggested, and the estimated yields of the principal crops are given for each soil. This section also includes suggestions concerning the management of the soils for fruits and vegetables, for woodland, and for pine plantations. Finally, some facts are given about the soils in regard to their use for wildlife and for outdoor recreation.

The major problems in the use and management of the soils vary somewhat among different parts of Pulaski and Alexander Counties.

On the bottom lands along the Mississippi and Ohio Rivers, the soils are nearly level, deep, and fertile. In these areas, maintenance of tilth is difficult in the fine-textured soils, slight droughtiness is a limitation in some soils that are shallow to sand, and overflow is a hazard where the soils are not protected by levees.

The soils on the bottom lands of the Cache River are less fertile than those along the Mississippi and Ohio Rivers, and they are poorly drained and are often wet. Overflow is a hazard, and tilth is difficult to maintain.

The soils on low terraces are closely associated with those on bottom lands. They are low to moderate in fertility, are often wet late in spring, and are low in organic-matter content. Sloping areas are subject to erosion. Near Ullin, Tamms, and Olive Branch are sandy soils, which may be droughty.

On the uplands of Alexander County, the soils are moderately permeable and are fairly fertile, but they commonly are steep and, therefore, are subject to serious erosion. Many steep areas are stony. Few areas are suited to crops.

Hosmer silt loam is the major soil on the uplands in Pulaski County. This soil contains a fragipan. It is moderately deep, slowly permeable, and subject to serious erosion unless erosion is controlled.

Capability Groups of Soils

Capability classification is the grouping of soils to show, in a general way, their suitability for most kinds of farming. It is a practical classification based on limitations of the soils, the risk of damage when they are used, and the way they respond to treatment when used for the common field crops or for sown pasture. The classification does not apply to most horticultural crops or to rice and other crops that have special requirements. The soils are classified according to degree and kind of permanent limitation, but without consideration of major and generally expensive landforming that would change the slope, depth, or other characteristics of the soils; and without consideration of possible major reclamation projects.

In the capability system, all kinds of soils are grouped at three levels: the capability class, the subclass, and the management group.

Capability Classes, the broadest grouping, are designated by Roman numerals I through VIII. In class I are soils that have few limitations, the widest range of use, and the least risk of damage when they are used. The soils in the other classes have progressively greater natural limitations. In class VIII are soils and landforms so rough or otherwise limited that they do not produce worthwhile yields of crops, forage, or wood products. There are no class VIII soils in Pulaski and Alexander Counties.

Capability Subclasses are soil groups within one class; they are designated by adding a small letter, *e*, *w*, *s*, or *c*, to the class numeral, for example, IIe. The letter *e* shows that the main limitation is risk of erosion unless close-growing plant cover is maintained; *w* shows that water in or on the soil interferes with plant growth or cultivation (in some soils wetness can be partly corrected by artificial drainage); *s* shows that the soil is limited mainly because it is shallow, droughty, or stony; and *c*, used in only some parts of the United States, shows that the chief limitation is climate that is too cold or too dry.

In class I there are no subclasses, because the soils of this class have few limitations. Class V can contain, at the most, only subclasses indicated by *w*, *s*, and *c*, because the soils in it are subject to little or no erosion, though they have other limitations that restrict their use largely to pasture, range, woodland, wildlife, or recreation.

Management Groups are soil groups within the subclasses. All the soils in one management group are enough alike to be suited to the same crops and pasture plants, to require similar management, and to have similar productivity and other responses to management. Management groups are generally designated by adding an Arabic numeral to the subclass symbol, for example, IIe–4 or IIIw–5. Thus, in one symbol, the Roman numeral designates the capability class, or degree of limitation; the small letter indicates the subclass, or kind of limitation; and the Arabic numeral specifically identifies the management group within each subclass.

Management by Groups of Soils

All soils in one management group have about the same limitations and similar risks of damage and therefore need about the same kind of management. In the following paragraphs, the management groups are described, and management suitable for all the soils of one group is suggested. Suggestions are not given for liming and fertilizing, because the soils should be tested and lime and fertilizer should be applied in amounts indicated by the tests.

To find what management group a specific soil is in, refer to the section "Descriptions of the Soils" or to the "Guide to Mapping Units," which is at the back of this survey.

Class I. Soils that have few limitations that restrict their use

Management Group I-1

This group consists of deep, nearly level, light-colored and moderately dark colored silt loams of the Millbrook, Harvard, and Wheeling series. The Millbrook soil is somewhat poorly drained, the Harvard soil is well drained or moderately well drained, and the Wheeling soil is well drained. These soils are on terraces. They are moderately permeable or moderately slowly permeable and have high available moisture capacity. They respond well to management and are moderately or highly productive.

The soils of this group have few limitations that restrict their use for crops. They can be farmed intensively and are well suited to corn, soybeans, wheat, cotton, and other field crops. Corn and soybeans can be grown 3 years out of 4. Under high-level management, corn can be grown continuously. High-level management includes spring plowing, varying the depth of plowing to prevent the formation of a plowpan, and growing winter cover crops to maintain the organic-matter content.

The Millbrook and Harvard soils generally are medium acid or slightly acid and are fairly high in nitrogen, phosphorus, and potassium. The Wheeling soil is strongly acid and is moderate or low in nitrogen, phosphorus, and potassium. It is lower in organic-matter content than the Millbrook and Harvard soils and thus requires more frequent use of cover crops and meadow crops.

Some low areas of the Millbrook soil would be benefited by drainage, but since this soil is not protected by levees, the ditches may be damaged by floods. The other soils in the group normally do not require drainage.

These soils are generally used for cash crops, but they are also well suited to hay and pasture and to most grasses and legumes. In wet areas of the Millbrook soil, alfalfa may be winterkilled, or it may be damaged by frost heaving. Alsike clover and Ladino clover can be grown in these areas. Frost heaving is lessened if grasses are seeded with alfalfa.

Management Group I-2

This group consists of deep, moderately well drained and well drained, light-colored silt loams of the Haymond and Sharon series. These soils occur in small and medium-sized areas on level or nearly level creek bottoms. They are moderately permeable and have high available moisture capacity.

These soils are well suited to crops, or they can be used for pasture or woodland. Their use depends somewhat on the size and location of the areas. Small areas are often used in the same way as adjacent soils.

Corn, soybeans, wheat, and other field crops grow well if management is good. Under high-level management these crops can be grown continuously. High-level management includes spring plowing, heavy application of fertilizer, reduced tillage, and return of all crop residues to the soils. Under average management, a more diverse cropping system is needed, and in addition a green-manure crop should be turned under every third year, or grasses and legumes should be allowed to stand 1 year out of 4.

These soils are low in nitrogen and low to medium in phosphorus and potassium. Both soils are acid, but the Haymond soil is generally less acid than the Sharon.

These soils are subject to occasional flash floods. Although the floods are of short duration, the water velocity is likely to be high, and pastures and winter wheat are likely to be damaged by scouring or by the deposition of debris or silt.

If used for pasture, these soils need to be seeded with a suitable mixture of tall fescue, orchardgrass, timothy, alfalfa, lespedeza, or Ladino clover. It is desirable to kill or remove all trees, brush, and weeds before seeding. Control of weeds and brush on established pastures and regulation of grazing are important, particularly if the vegetation is short.

Management Group I-3

This group consists of areas of the deep, somewhat poorly drained to well-drained, moderately dark colored, nearly level Allison, Gorham, Newart, and Tice soils that are on bottom lands protected by levees. Areas of these soils not protected by levees are in management group IIw-5. These soils have silt loam and silty clay loam texture, and they have high available moisture capacity. All are moderately permeable except the Tice soil, which is moderately to moderately slowly permeable.

Corn, soybeans, wheat, and cotton are well suited. Under high-level management, row crops can be grown continuously. High-level management includes fertilization based on crop needs and soil tests, minimum tillage, return of all crop residues to the soils, and protection from wind erosion in winter. Under average management, a green-manure crop is turned under every fourth year, or a grass-legume meadow is left for one full year.

These soils are slightly acid to mildly alkaline, and they are high in potassium and phosphorus. An adequate amount of fertilizer is needed for good yields because these soils are protected by levees and are no longer supplied with nutrients from floodwater.

The Allison soils are well drained. The other soils are somewhat poorly drained and may need additional drainage. Tile functions well, but care must be taken in tiling the Newart and Gorham soils because the sandy substratum does not provide a firm support for tile if it is laid deep enough to be in the sandy layer. Open ditches also work well.

Pasture plants grow well on these soils. Depleted pastures can be reseeded to mixtures of tall fescue, orchardgrass, alfalfa, or Ladino clover. Pastures need to be clipped regularly for control of weeds and brush, and grazing should be regulated.

Class II. Soils that have moderate limitations that reduce the choice of plants or require special conservation practices

SUBCLASS IIe. SOILS SUBJECT TO MODERATE EROSION IF THEY ARE NOT PROTECTED

Management Group IIe-1

This group consists of deep, well-drained, gently sloping and moderately sloping, light-colored silt loams on uplands and terraces. These soils are moderately permeable or moderately slowly permeable and have high available moisture capacity. They normally are low in nitrogen and phosphorus and low or medium in potassium, but they respond well to treatment. Erosion control measures are needed.

The soils of this group are well suited to corn, soybeans, wheat, or cotton, and they can also be used for pasture or woodland. Small areas are often used in the same way as adjacent larger areas of other soils. Slopes commonly are short and average only about 100 feet in length. Consequently, if these soils are cultivated, at least one meadow crop in 4 years is needed to help control erosion. If the slopes are more than 4 percent, 1 year of meadow in 3 years is necessary. If contouring or other erosion control measures are used, the proportion of meadow crops to row crops can be reduced. Lime and fertilizer are needed.

The removal of brush and sprouts is necessary if these soils are used for pasture. Seedbeds can be prepared by plowing on the contour. Depleted pastures can be seeded to mixtures of tall fescue, orchardgrass, lespedeza, alfalfa, Ladino clover, or other suitable species. Established pastures need to be clipped regularly for control of weeds and brush. Regulation of grazing is particularly important if the soils are wet or the vegetation is short.

Management Group IIe–2

This group consists only of Hosmer silt loam, 2 to 4 percent slopes. This is a moderately well drained, gently sloping, light-colored soil of the uplands. The root zone is limited by a fragipan that begins at a depth of 30 to 36 inches. The fragipan is slowly permeable and limits the amount of moisture available to plants. Natural fertility is low, but crops respond moderately well to treatment.

This soil is well suited to corn, soybeans, and wheat. It is also suited to pasture or woodland. Use depends on the size and location of the area. Small narrow areas or areas that are not readily accessible generally are used in the same way as adjacent soils.

For control of erosion, cultivated fields need to be left in meadow 1 year in 3. If fields are contoured, a meadow crop every fourth year will control erosion adequately. High-level management includes large applications of fertilizer, contour tillage, minimum tillage, return of all residues, and growing green-manure cover crops.

This soil is strongly acid, and it is low in nitrogen and phosphorus and low to medium in potassium. The organic-matter content is also low. Therefore, it is especially important that all crop residues be returned. Plowing under green-manure crops, winter cover crops, or standover meadow is also important.

If this soil is used for pasture, brush and sprouts ought to be killed or removed and the seedbed prepared by plowing on the contour. Depleted pastures can be seeded with mixtures of tall fescue, orchardgrass, timothy, lespedeza, alfalfa, or Ladino clover. Established pastures need to be clipped to control weeds and brush. Regulation of grazing is important, particularly when the soil is wet or the vegetation is short.

Management Group IIe–3

Sandy loams on gently sloping and moderately sloping stream terraces make up this group. They consist of deep, light-colored, generally well-drained soils of the Alvin series and a somewhat poorly drained, gently sloping soil of the Roby series. These soils are moderately permeable, have moderate available moisture capacity, and are moderately productive.

These soils are used principally for corn, soybeans, wheat, and cotton. The slopes ordinarily are short, only 100 feet or less in length, and under average management, a cropping system that includes a green-manure catch crop every second year will provide adequate control of erosion. If the slopes are stronger than 4 percent, a standover meadow crop is needed every fourth year. If contoured, these soils can be cropped continuously, provided a winter cover crop is seeded in the row crops.

Winter cover crops not only help to control erosion; they also provide organic matter, which is needed to improve the moisture-holding capacity, to provide nutrients, and to check wind erosion. The return of all crop residues helps to maintain the organic-matter content.

These soils are acid, and they are low in nitrogen, phosphorus, and potassium. They do not retain nutrients well. Consequently, moderate amounts of fertilizer should be applied as needed. Amounts larger than are needed for 1 year's crop are likely to be leached away.

If these soils are used for pasture, a seedbed can be prepared by plowing on the contour. A suitable mixture consists of plants suited to droughty soils, such as tall fescue, orchardgrass, alfalfa, and lespedeza.

Management Group IIe–4

This group consists of deep, nearly level to gently sloping, somewhat poorly drained, moderately dark colored soils of the Gorham and Tice series. These soils are on bottom lands. They are moderately or moderately slowly permeable, have high available moisture capacity, and are naturally fertile. All of these soils are subject to slight erosion, and most areas are subject to flooding by the Ohio or Mississippi Rivers.

The soils in this group are well suited to corn and soybeans. They are also suited to wheat and cotton if they are protected from flooding. If these soils are plowed in spring and cultivated either on the contour or across the slope, row crops can be grown continuously. Otherwise, a green-manure crop or standover meadow is needed to help control erosion.

These soils have a high content of clay in the surface layer. They need additions of organic matter to maintain or to improve tilth. Winter cover crops or green-manure crops can be used for this purpose. All crop residues should be plowed under.

These soils are slightly acid to mildly alkaline. Phosphorus and potassium levels are high, and nitrogen generally is the only amendment needed. Additional fertilizers may be needed for above average yields in areas protected from overflow.

Pasture plants grow well, but areas subject to overflow may not be suitable for pasture. Areas protected by levees can be seeded to such mixtures as tall fescue, orchardgrass, alfalfa, or Ladino clover.

SUBCLASS IIw. SOILS THAT HAVE MODERATE LIMITATIONS BECAUSE OF EXCESS WATER

Management Group IIw–1

In this group are deep, somewhat poorly drained, nearly level and gently sloping, light-colored silt loams on terraces and uplands. These soils are slowly permeable, and they have moderately high available moisture capacity. In dry years, they do not supply enough moisture for best plant growth. Fertility is moderate, but crops respond moderately well to treatment.

These soils are used principally for corn, soybeans, wheat, and cotton. Some areas are used for hay and pasture, and others are used for woodland.

Surface ditches may be needed to drain nearly level areas that are used for crops or pasture. Tile does not function well in these soils.

If slopes are contoured, a green-manure crop every other year or one full year of meadow every 4 years will control erosion adequately. If slopes are not contoured, 1 year of meadow every 3 years is needed.

These soils are strongly acid. They are low in nitrogen and phosphorus and are low to medium in potassium. They are somewhat low in organic-matter content. The organic-matter content can be maintained by returning all crop residues and plowing under cover crops or green-manure crops.

Depleted pastures can be seeded to such mixtures as tall fescue, orchardgrass, alfalfa, or Ladino clover. Pastures need to be clipped regularly to control weeds. Grazing should be regulated.

Management Group IIw–2

This group consists of moderately deep, poorly drained, moderately dark colored silty clays on nearly level to moderately sloping bottom lands. These soils have a sandy substratum at a depth of 10 to 30 inches. They are slowly permeable and have moderate available moisture capacity. Fertility is moderate, but crops respond moderately well to treatment.

The soils in this group are used principally for corn, soybeans, wheat, and cotton. They are also suited to pasture or woodland.

These soils are slightly acid to mildly alkaline. They are moderate in nitrogen and moderate to high in phosphorus and potassium. In areas not protected by levees, good yields can be obtained by the use of nitrogen fertilizer, but for better yields other fertilizers are needed. In areas that have been protected by levees for many years, these soils are beginning to show deficiencies in phosphorus and potassium.

Level areas may require drainage. Only surface ditches can be used, because tile does not function properly if laid in the silty clay, and it is not adequately supported in the sandy layer.

Sloping areas need to be protected from erosion. Otherwise, the continued loss of the surface soil will bring the less productive sandy layer closer to the surface. Erosion can be controlled adequately by farming on the contour and using green-manure crops and cover crops in the crop rotation. To maintain the organic-matter content of the surface soil, return all crop residues and plow under green-manure and cover crops. These soils are difficult to keep in good tilth and should not be tilled when wet. Fall plowing generally is best.

In unprotected areas, drainage ditches are subject to damage by overflow, and the growing of small grain and of overwintering grasses and legumes is risky. Large applications of fertilizer generally are not needed in these areas.

Pastures can be seeded to mixtures of tall fescue, timothy, alsike clover, Ladino clover, or other plants suited to wet conditions. Control of grazing is needed, particularly during unusually dry or unusually wet periods.

Management Group IIw–3

This group consists of deep, somewhat poorly drained, level and gently sloping, light-colored silt loams of the Belknap, Dupo, and Wakeland series. These soils are on bottom lands. They are moderately slowly permeable and have high available moisture capacity. Fertility is moderate, but the response to treatment is good.

The soils in this group are used about equally for crops, pasture, and woodland. Many of the bottom lands are small, particularly those that slope more than 2 percent. In these areas the soils are often used in the same way as adjacent soils.

Corn, soybeans, and wheat are the common crops. Under high-level management, level areas can be farmed continuously. High-level management includes adequate drainage, regular use of green-manure crops or cover crops, and minimum tillage. For drainage, surface ditches are more satisfactory than tile because tile functions slowly in these soils.

Many areas are subject to occasional flash floods and overflow. Consequently, diversion ditches are needed in places to intercept water from sidehills. Drainage ditches that direct water safely along channels will help to prevent scouring and deposition of new material or debris. Protective measures on the entire watershed may be necessary to reduce the hazard of flooding.

Simple erosion control measures are needed in sloping areas that are used for crops. Contouring and a rotation that includes cover crops every other year or standover meadow every fourth year will control erosion adequately.

The Belknap and Dupo soils normally are strongly acid, and the Wakeland soils generally are slightly acid. The nitrogen content is low, and the phosphorus and potassium content is medium to high.

Depleted pastures can be seeded to mixtures of tall fescue, orchardgrass, timothy, alsike clover, Ladino clover, or other plants suited to wet conditions. Alfalfa can be grown in sloping areas but may be subject to heaving and winterkilling in wet level areas.

Management Group IIw–4

This group consists principally of deep, level, poorly drained, light-colored and moderately dark colored silty clay loams of the Beaucoup and Petrolia series, but it also includes some silt loam and silty clay overwash phases of these soils. Permeability is moderately slow, and the available moisture capacity is high. Fertility is moderate to moderately high, and the response to treatment is also moderate to high.

These soils are used for corn, soybeans, and wheat. Some areas are wooded, and a few areas are in pasture. Growing a green-manure crop at least every third year and returning all crop residues to the soils help to maintain tilth, to increase surface infiltration, and to reduce crusting in cultivated fields. Overwintering grasses and legumes can be grown where the risk of overflow is not great. These soils should not be tilled when wet. Fall plowing may be desirable.

The soils in this group are slightly acid to neutral in reaction. They generally are low to medium in nitrogen and phosphorus and medium to high in potassium.

Surface ditches can be used to remove excess water from these soils. Tile can be used in these soils if outlets are available and overflow is not a problem. Tile generally

functions better in the Beaucoup soils than in the Petrolia soils. Overflow is a hazard on the Beaucoup soils that are not protected by levees and on the Petrolia soils that are adjacent to the Cache River.

Pastures can be seeded to mixtures of tall fescue, timothy, alsike clover, Ladino clover, reed canarygrass, and other plants that are suited to wet conditions. Control of grazing is important, particularly when the soils are wet in spring.

Management Group IIw–5

In this group are areas of the nearly level Allison, Gorham, Newart, and Tice soils that are not protected by levees (fig. 9). The areas protected by levees are in management group I–3.

***Figure 9.*—Tice and Newart soils on Mississippi River bottom lands, at extreme southern tip of Illinois. These soils are flooded nearly every spring either by the Mississippi River, which lies to the immediate left, or by the Ohio River, which lies one-half mile to the right.**

This group consists of deep, somewhat poorly drained to well drained, moderately dark colored soils on bottom lands. Tice silty clay, overwash, is moderately permeable to moderately slowly permeable. The other soils have a silt loam and silty clay loam surface layer, are moderately permeable, and have high available moisture capacity. All of the soils in this group are highly productive.

These soils are used mainly for corn, soybeans, wheat, and cotton. A small acreage has remained wooded, but little or no acreage is used for pasture. Row crops can be grown continuously. Winter grain or standover grasses and legumes are likely to be damaged by overflow. Green-manure crops or cover crops need to be grown every third or fourth year to help maintain good tilth. Crop residues that are returned to the soils aid in maintaining the organic-matter content. Cornstalks that are left standing during winter help to reduce damage from overflow.

The soils in this group are slightly acid to mildly alkaline. They are medium in nitrogen and high in phosphorus and potassium. Favorable yields generally can be obtained without the use of lime, or of fertilizers other than nitrogen.

These soils ordinarily are not used for pasture, because of the likelihood of damage by overflow. If they are needed for pasture, they can be seeded with tall fescue, timothy, alsike clover, or Ladino clover.

SUBCLASS IIs. SOILS THAT HAVE MODERATE LIMITATIONS BECAUSE OF LOW MOISTURE CAPACITY

Management Group IIs–1

This group consists of deep, nearly level, somewhat poorly drained and well-drained, light-colored fine sandy loams on terraces. These soils are moderately permeable, and they have moderate available moisture capacity. Natural fertility is medium, and the response to management is moderate.

The soils of this group are used principally for corn, soybeans, wheat, and cotton. They are also suitable for pasture and woodland. The major problems are to retain moisture, to increase fertility, and to maintain the organic-matter content. Wind erosion is a hazard if these soils are left bare.

Cover crops, green-manure crops, or grasses and legumes help to maintain the organic-matter content, to increase the supply of nitrogen, to retain moisture, and to reduce the hazard of wind erosion. Crop residues left on the soil as trash mulch help to control wind erosion during winter and aid in maintaining the supply of organic matter.

These soils generally are acid, and they are low in nitrogen, phosphorus, and potassium. Because of the likelihood of leaching in these sandy soils, medium amounts of fertilizer should be applied as needed.

Mixtures of tall fescue, orchardgrass, alfalfa, lespedeza, and other drought-resistant plants are suitable for seeding in pastures.

Management Group IIs–2

In this group are somewhat poorly drained and moderately well drained, level to gently sloping, dark-colored silty clay loams and silt loams of the Riley and Ware series. These soils are on bottom lands. They are underlain by a sandy substratum at a depth of about 10 to 30 inches. They are moderately permeable and have medium available moisture capacity.

These soils are well suited to the common field crops, including corn, soybeans, wheat, and cotton, and to hay and pasture crops. They are also well suited to woodland but generally are not used for this purpose.

Many areas are protected by levees. Wheat, hay, or pasture crops are likely to be damaged by overflow in unprotected areas. Where the risk of frequent overflow is not great, winter cover crops, green-manure crops, or standover meadow crops should be grown frequently. The additional organic matter derived from these crops helps to improve the tilth of the Riley soils and to increase the available moisture capacity of the Ware soils.

The soils of this group are slightly acid to mildly alkaline, and they are high in potassium and phosphorus. Good yields generally can be obtained with the use of nitrogen fertilizer alone, but yields are better if enough potassium and phosphorus are applied to replace the amounts used by the crops. Fertilizer may not be utilized on soils that are subject to overflow.

Control of erosion is a slight problem on slopes. Loss of the surface soil brings the sandy substratum closer to the surface and decreases both the available moisture capacity and the nutrient capacity. If cultivation is on the contour

or across the slope, a rotation that includes grasses and legumes 1 year in 4 generally is adequate to control erosion.

Pasture crops grow well on these soils. Depleted pastures can be seeded with a mixture of tall fescue, orchardgrass, timothy, alfalfa, red clover, or lespedeza. Pastures need to be clipped regularly to control weeds and brush. Regulation of grazing is important.

Management Group IIs-3

This group consists of only one soil, Elsah silt loam. This is a moderately well drained or well drained, nearly level to gently sloping, light-colored soil of the bottom lands. It is underlain by chert and is moderately permeable. The available moisture capacity is moderate, but the supply of moisture generally is not adequate for best crop growth because of the cherty substratum. Natural fertility is moderate, and the response to treatment is moderate to low.

This soil is suited to the common field crops, including corn, soybeans, wheat, and hay, but is commonly used for pasture or woodland because it occurs as narrow or small areas of bottom lands that are not readily accessible.

The reaction is slightly acid or neutral, and normally only light applications of lime are needed for crops or pasture. The phosphorus content ordinarily is low, and the potassium content is medium. The nitrogen content is also low but can be increased through the use of fertilizer or by growing legumes.

Simple erosion control measures are needed if sloping areas are used for crops. This soil is subject to flash floods, and it is likely to be damaged by streambank cutting, scouring, and the accumulation of silt and debris. As a rule, little protection is possible, but ditches and diversions help to control floodwater or to divert water from critical areas.

Depleted pastures can be seeded with a mixture of tall fescue, orchardgrass, timothy, alfalfa, Ladino clover, or lespedeza. Control of weeds and brush is important in areas used for pasture.

Class III. Soils that have severe limitations that reduce the choice of plants or that require special conservation practices, or both

SUBCLASS IIIe. SOILS SUBJECT TO SEVERE EROSION IF THEY ARE CULTIVATED AND NOT PROTECTED

Management Group IIIe-1

This group consists mainly of deep, well drained and moderately well drained, light-colored silt loams on uplands and terraces. Most of these soils are strongly sloping and slightly to moderately eroded, but one is gently sloping and severely eroded. One soil with a fine sandy loam surface layer is included in this group. These soils are moderately or moderately slowly permeable, have high available moisture capacity, and are moderately fertile.

The soils in this group are suited to corn, soybeans, wheat, and hay crops, but small areas, narrow areas, and areas not readily accessible can be used to better advantage for pasture or woodland. Practices to control erosion are needed if cultivated crops are grown. On slopes more than 100 feet in length, hay crops are needed 3 years in 5 to help control erosion if contouring is the only erosion control practice. If fields are stripcropped and terraced, row crops can be grown more frequently (fig. 10). On stream terraces, the slopes generally are less than 100 feet in length, and a rotation that includes a hay crop 2 years in 4 will control erosion if fields are tilled on the contour.

***Figure 10.*—Stripcropping on Alford silt loam. Stripcropping is a method of erosion control on class II and class III land.**

Lime is needed on three soils in this group to correct the acidity. Nitrogen, phosphate, and potash should be applied as needed if good yields are to be obtained.

Grassed waterways are difficult to establish because the soils are erodible and runoff is rapid. To aid in the establishment of waterways use heavy applications of manure, work mulches well into the soils, and seed fescue liberally, with sudangrass, rye, or corn as a nurse crop.

Control of brush and sprouts is important in pastures. All cultivation should be on the contour. Pastures can be seeded with a mixture of tall fescue, orchardgrass, timothy, lespedeza, alfalfa, or Ladino clover.

Management Group IIIe-2

This group consists of moderately well drained, sloping and strongly sloping silt loams on the uplands. Although these soils are deep, the root zone is only moderately deep because of a dense brittle fragipan that occurs at a depth of 24 to 30 inches. This dense layer is slowly permeable and somewhat restricts the available moisture capacity. The soils of this group are medium in natural fertility but respond moderately well to management. Control of erosion is a serious problem if they are cultivated.

These soils are suitable for corn, soybeans, wheat, and hay if measures are taken to control erosion. If fields that have a gradient of less than 7 percent are contoured, a rotation that includes hay crops 1 year in 3 is suitable. If the fields are not contoured or if the slope is greater than 7 percent, hay crops are needed 3 years out of 5 to help control erosion. Terracing, stripcropping, and other high-level management measures reduce the proportion of hay crops needed in the rotation.

These soils are strongly acid, and they are low in nitrogen and phosphorus and low or medium in potassium. The organic-matter content is also low. Return of all crop residues helps to maintain tilth and to prevent crusting. Depleted pastures can be reseeded to grasses and legumes, including tall fescue, orchardgrass, timothy, alfalfa, and

Ladino clover. All seedbed preparation should be on the contour, to help control runoff and erosion. Control of weeds and brush and regulation of grazing are particularly needed if the soils are wet or the vegetation is short.

SUBCLASS IIIw. SOILS THAT HAVE SEVERE LIMITATIONS BECAUSE OF EXCESS WATER

Management Group IIIw–1

The soils in this group are moderately deep, somewhat poorly drained, level to gently sloping, light-colored silt loams on terraces. They are very slowly permeable and have moderate available moisture capacity. Fertility is low, and the response to treatment is moderate.

These soils are used mainly for corn, soybeans, and wheat. A few areas are used for pasture and woodland. Drainage is needed in some level or gently sloping areas that are used for crops or pasture. Surface ditches and furrows should be used because tile does not function satisfactorily in these soils.

Control of erosion is a problem in sloping areas. If slopes are farmed on the contour, 1 year of meadow in 4 years provides adequate control.

These soils are strongly acid, and they are low in nitrogen, phosphorus, and potassium. Organic matter in the form of crop residues, green-manure crops, and cover crops helps to improve tilth and to increase productivity.

Mixtures of tall fescue, orchardgrass, Ladino clover, alsike clover, or other plants suited to wet conditions are suitable for seeding in pastures. Established pastures need to be clipped regularly. Regulation of grazing is important.

Management Group IIIw–2

This group consists mainly of poorly drained, light-colored silt loams on terraces and uplands. One soil has a fine sandy loam surface layer. Permeability is slow or very slow, and the available moisture capacity is moderate. Fertility is low to moderate, and the response to treatment is also low to moderate.

These soils are used mainly for corn, soybeans, and wheat, and occasionally for cotton. They are also used for pasture and woodland. Providing adequate drainage is a major problem. Surface ditches and furrows should be used to remove excess water because tile does not function satisfactorily in the slowly permeable or very slowly permeable subsoil. During the latter part of the summer, crops commonly are damaged by lack of moisture, partly because of a compact subsoil that restricts the penetration of roots and the movement of water. If fertility is kept at a high level, plant roots are able to penetrate the subsoil and draw upon a much larger volume of soil water (*9*).[2]

These soils are strongly acid, and they are low in nitrogen, phosphorus, and potassium. Low fertility is a serious limitation.

The organic-matter content can be maintained by growing cover crops, green-manure crops, or meadow crops. The return of all crop residues to the soils improves tilth, reduces crusting and puddling, improves the rate of infiltration, and increases the available moisture capacity. If these soils are plowed in fall, the surface soil tends to puddle and to run together during winter months.

Pastures can be seeded with a mixture of tall fescue, timothy, alsike clover, Ladino clover, or other plants suited to wet conditions. Alfalfa can be used, but it may be winterkilled or damaged by frost heaving if grown on wet soils.

Management Group IIIw–3

In this group are deep, level, poorly drained, light-colored silt loams on bottom lands. These soils are slowly permeable and have high available moisture capacity. The organic-matter content is low, and natural fertility is low. The response to treatment is moderate.

The soils in this group are used mainly for crops, but a large acreage is also used for pasture and woodland. Corn, soybeans, and wheat are the principal crops.

If these soils are plowed in fall or tilled when wet, the surface soil tends to puddle. The organic-matter content can be increased by growing a green-manure crop at least every third year and returning all crop residues to the soils. Additions of organic matter will improve tilth, reduce surface crusting, improve the rate of infiltration, and increase the available moisture capacity.

These soils generally need drainage. Surface ditches should be used because tile does not function satisfactorily. Many areas are subject to overflow. Small levees help to protect these areas, and ditches can be used to divert water that runs off nearby hills, but adequate control of overflow commonly involves protection of an entire watershed. Maintenance of drainage ditches, including the control of brush, will speed the removal of excess water and reduce the amount of overflow. The growing of small grain, grasses, and legumes may be somewhat risky in areas subject to frequent overflow. Some wet spots on the Birds soil can be used and managed in the same way as the soils in management group Vw–1. These spots are indicated on the detailed soil map by wet spot symbols.

These soils generally are slightly to strongly acid. They are low in nitrogen and phosphorus and low to medium in potassium. Regular additions of nitrogen are needed for good crop yields.

Pastures can be seeded with a mixture of tall fescue, timothy, alsike clover, Ladino clover, or other plants suited to wet conditions. Reed canarygrass can be used in very wet spots. Careful control of grazing is desirable.

Management Group IIIw–4

In this group are poorly drained to very poorly drained silty clay loams and silty clays of the Darwin and Cairo series. These soils occur mainly on level or nearly level bottom lands. They are moderately dark colored, deep, and slowly permeable. The available moisture capacity is moderate to high, but the supply of moisture may not be adequate for best plant growth, particularly on the Cairo soils, which are underlain by sand. Fertility is moderate or moderately high, and the response to treatment is moderate.

The soils of this group are suited to the common field crops including corn, soybeans, wheat, and cotton. Although the Cairo soils and Darwin silty clay loam are used mainly for crops, nearly two-thirds of the acreage of the other Darwin soils is in woodland. Pasture is also a suitable use, but little of the acreage is pastured.

These soils are slightly acid to neutral. They are low to medium in nitrogen and phosphorus and medium to high

[2] Italic numbers in parentheses refer to Literature Cited, p. 119.

263-321—68——4

in potassium. Fair yields can be obtained without the use of fertilizer, but for better yields, fertilizer is needed.

Drainage is needed on these soils, particularly in low areas that are subject to ponding by runoff from adjacent higher areas. Surface ditches should be used (fig. 11) because tile will not function satisfactorily. Where these soils are not protected by levees, drainage ditches may be damaged by overflow. Growing small grain and hay crops is somewhat risky in these areas, and large applications of fertilizer may not be profitable.

Figure 11.—**Drainage ditch through Darwin silty clay.**

Maintenance of tilth is a problem, especially on the silty clays. As a rule, tilth can be maintained if all crop residues are left on the soils and green-manure crops or cover crops are grown. Fall plowing generally is desirable. These soils should not be tilled when wet.

Sloping areas are slightly susceptible to erosion, but since most slopes are short, graded contouring and the use of cover crops and green-manure crops control erosion adequately.

Pastures can be seeded with a mixture of tall fescue, timothy, alsike clover, Ladino clover, reed canarygrass, or other plants suited to wet conditions. Grazing should be controlled, particularly when the soils are wet.

Management Group IIIw-5

In this group are level, poorly drained or very poorly drained, light-colored silty clay loams and silty clays on bottom lands. These soils are deep, and they are slowly to very slowly permeable. The available moisture capacity is moderate, and the moisture supply is not adequate for best plant growth in most seasons. Natural fertility is low to moderate, and the response to treatment is moderate to moderately low.

The soils in this group are suitable for corn, soybeans, and wheat if they are drained and protected from overflow. They are also suitable for pasture and woodland. They are used almost equally for crops and woodland, but little of the acreage is pastured.

These soils are strongly acid to neutral, and they are low in nitrogen and low to medium in phosphorus and potassium.

Drainage is needed if crops are grown. Surface ditches should be used, because tile does not function satisfactorily. Drainage is especially needed in low areas that are subject to ponding by runoff from adjacent higher areas. Ditches in these areas require extra maintenance, and the growing of small grain and hay crops is somewhat risky. Some areas along the Cache River cannot be drained unless extensive channel improvements are made.

Maintenance of tilth is a problem, especially on the silty clays. Generally, tilth can be maintained if all crop residues are left on the soils and green-manure crops or cover crops are grown. Soybeans, sudangrass, lespedeza, or fescue can be used for a green-manure crop in areas where overflow prevents the use of overwintering crops. Fall plowing is advisable. These soils should not be tilled when they are wet.

Pastures can be seeded with a mixture of tall fescue, timothy, alsike clover, Ladino clover, reed canarygrass, or other plants suited to wet conditions. Control of grazing is important, particularly when the soils are wet or droughty.

SUBCLASS IIIs. SOILS THAT HAVE SEVERE LIMITATIONS BECAUSE OF LOW MOISTURE CAPACITY

Management Group IIIs-1

This group consists of well-drained, nearly level and gently sloping, light-colored and moderately dark colored sandy soils of the Disco, Landes, and Lamont series. These soils are on terraces and bottom lands. Permeability is moderately rapid, and the available moisture capacity is low to moderately low. Fertility is low to moderate. The response to treatment is moderate or high.

These soils are used principally for cultivated crops, but they are also suited to hay crops, pasture, and woodland. Corn and soybeans are the main crops, although some wheat and cotton are grown.

Areas of the Landes soils that are not protected by levees are subject to overflow. In these areas, it may not be profitable to grow small grain, hay, and pasture because of the likelihood of damage by flooding. Under high-level management, row crops can be grown continuously on the level soils. Additions of organic matter are needed to improve tilth, to increase both the nutrient capacity and the available water capacity, and to reduce wind erosion. The organic-matter content can be maintained or increased by returning all crop residues to the soils and by growing green-manure crops or winter cover crops frequently. Irrigation is beneficial.

The Lamont and Disco soils are acid, and they are low to medium in phosphorus, potassium, and nitrogen. The Landes soils are nearly neutral to mildly alkaline, and they are high in phosphorus and potassium. Fairly good yields can be obtained on the Landes soils by the use of nitrogen fertilizer alone. Because of their high content of sand, the soils of this group cannot retain nutrients well. Consequently, moderate amounts of fertilizer, applied as needed, are more satisfactory than a large single application.

Sloping areas are subject to slight erosion during heavy rains. To help control erosion in these areas, slopes should be contoured and a green-manure crop or winter cover crop seeded every third or fourth year. Crop residues left on the surface during the winter help to check both water and wind erosion.

Pastures can be seeded with a mixture of tall fescue, orchardgrass, redtop, alfalfa, lespedeza, or other plants suited to droughty conditions.

Class IV. Soils that have very severe limitations that restrict the choice of plants, require very careful management, or both

SUBCLASS IVe. SOILS SUBJECT TO VERY SEVERE EROSION IF THEY ARE CULTIVATED AND NOT PROTECTED

Management Group IVe-1

This group consists mainly of strongly sloping severely eroded soils and moderately steep eroded soils, on uplands and terraces. A few areas of the moderately steep soils are only slightly eroded. All of these soils are deep, light colored, and well drained or moderately well drained. They are moderately permeable or moderately slowly permeable and have high available moisture capacity. Although, as a whole, they are moderately fertile and respond well to treatment, the severely eroded soils are lower both in fertility and in response to treatment than the less eroded soils.

The soils in this group are suited to pasture or hay crops, and they can be used to a limited extent for corn, soybeans, or wheat. Erosion is a serious hazard, and surface runoff must be carefully controlled. Row crops can be grown occasionally in most areas if fields are tilled on the contour (fig. 12). The slightly eroded and moderately eroded steeper slopes should not be used for row crops if they are more than 100 feet long. Under high-level management, the cropping system for severely eroded slopes that are more than 100 feet long would include a meadow crop 4 years in 6. Severely eroded slopes that are less than 100 feet long ought to be left in meadow at least 2 years out of 4. Another suitable cropping system would be 1 year of small grain, planted on the contour, and 4 years of grass-legume meadow. On slopes that are less than 100 feet long, a cropping system that includes a row crop for 1 year, a small grain for 1 year, and grass-legume meadow for 3 years is suitable. Where terracing or stripcropping is feasible, row crops can be grown more frequently without increasing the erosion hazard.

Lime is needed to correct acidity. Nitrogen is needed, and phosphate and potash should be applied in amounts indicated by soil tests.

Grassed waterways are difficult to establish because the soils are erodible and steep, and runoff is rapid. Using heavy applications of manure, working mulches into the soils, and seeding fescue liberally, with sudangrass, rye, or corn as a nurse crop, will aid in the establishment of waterways.

Where these soils are used for pasture, it is preferable to prepare the seedbed by disking several times, beginning several months before seeding time. Erosion is less likely if the seedbed is prepared by disking than if it is prepared by plowing, although plowing helps to control weeds, sprouts, and brush. If plowing is considered more desirable, it should be done on the contour. Pastures can be seeded with a mixture of tall fescue, orchardgrass, timothy, lespedeza, alfalfa, or Ladino clover. Established pastures need to be clipped to control weeds and brush. Grazing should be regulated.

Management Group IVe-2

This group is made up of moderately well drained, sloping and strongly sloping, severely eroded soils and moderately steep, eroded soils. These soils have a fragipan at a depth of 18 to 30 inches. The pan restricts the growth of roots and the movement of water. The soils of this group have moderate to low available moisture capacity and are low in fertility. They respond moderately well to treatment.

These soils are suited to hay or pasture, and they can be used to a limited extent for corn, soybeans, or wheat. The hazard of erosion is severe (fig. 13), and runoff must be carefully controlled. On slopes that are less than 100 feet long, the cropping system can include 1 year of corn or soybeans and 1 year of wheat in a 6-year rotation, if plow-plant methods are used and fields are tilled on the contour. On longer slopes or with other tillage methods, row crops are not suitable, and small grain should be grown only once in a 5-year rotation and grass-legume meadow the other 4 years.

Lime is needed to correct acidity. These soils are low in nitrogen and phosphorus and low to medium in potassium. The severely eroded soils are also low in organic-matter content. To increase the organic-matter content, return all crop residues to the soils.

Figure 12.—In background, Alford soil plowed on the contour. This soil is in management group IVe-1. It has been in long-term rotation pasture and will be returned to pasture following a year of corn.

Figure 13.—A badly gullied, poorly managed pasture on a steep hillside of Hosmer silt loam.

Grassed waterways are difficult to establish because the soils are erodible and steep and runoff is rapid. Using heavy applications of manure, working mulches into the soils, and seeding fescue liberally, with sudangrass, rye, or corn as a nurse crop, will aid in establishing waterways.

Where these soils are used for pastures, the seedbed should be prepared by plowing on the contour or by disking thoroughly several times, beginning several months before seeding time. Pastures can be seeded with a mixture of tall fescue, orchardgrass, timothy, lespedeza, or Ladino clover. Alfalfa is also suitable, although the root zone is somewhat limited by the fragipan. Established pastures need to be clipped to control weeds and brush. Grazing should be regulated.

Management Group IVe–3

This group consists of Markland soils, 4 to 12 percent slopes, severely eroded. These soils are on terraces. They are deep, moderately well drained, and slowly permeable, and they have medium to low available moisture capacity. Fertility is low, and the response to treatment is low. The Markland soils in Pulaski and Alexander Counties generally have a calcareous layer at a depth of less than 40 inches. This calcareous layer may limit the rooting depth of some plants.

These soils have few slopes that are more than 50 to 70 feet in length. If they are farmed on the contour, a meadow crop 1 year in 3 is adequate for control of erosion. If they are farmed up and down the slope, a cropping system of not more than 1 year of small grain and 2 years of meadow is needed to control erosion adequately, and corn or soybeans should not be grown.

The surface layer commonly is strongly acid, and lime is needed for good yields of either crops or pasture. These soils are low in nitrogen and phosphorus, low to medium in potassium, and low in organic-matter content. The return of all crop residues to the soils improves tilth, helps control erosion, and increases the porosity of the soil material.

Depleted pastures can be seeded with a mixture of fescue, orchardgrass, alfalfa, or Ladino clover. All preparation of the seedbed should be on the contour, to help control runoff and erosion. Established pastures need to be clipped regularly to control weeds and brush. Regulation of grazing is important, particularly if the soils are wet or if the vegetation is short.

SUBCLASS IVw. SOILS THAT HAVE VERY SEVERE LIMITATIONS FOR CULTIVATION BECAUSE OF EXCESS WATER

Management Group IVw–1

This group consists of only one soil, Okaw silty clay loam. This soil occurs on level terraces and is poorly drained. It is light colored, is very slowly permeable, and has moderate available moisture capacity. Natural fertility is low, and the response to treatment is low.

This soil is suited to crops but is limited in use for crops by wetness in spring, droughtiness in summer, and low fertility. The principal crops, in order of suitability, are wheat, hay, soybeans, and corn. Woodland is also a suitable use.

Drainage can be supplied only by the use of surface ditches and furrows. Even if drained, this soil dries slowly, becomes wet early in fall, and remains wet and cold until late in spring. In midsummer it is droughty because of its limited ability to supply moisture to plants. If a high level of fertility is maintained, however, plant roots can penetrate the heavy subsoil to a greater depth and draw upon a greater volume of soil moisture.

This soil is very strongly acid, and it is low in nitrogen, phosphorus, and potassium. Large amounts of lime and fertilizer are needed for proper plant growth, but other limitations often prevent the full use of plant nutrients. Consequently, only moderate yields can be obtained.

Fall plowing generally is not desirable, because the surface soil tends to puddle and run together during winter months, and spring plowing commonly leaves this soil cloddy. Organic matter in the form of crop residues, green-manure crops, and cover crops improves tilth, reduces surface crusting, improves infiltration, and increases the available moisture capacity.

Pastures can be seeded to a mixture of tall fescue, orchardgrass, timothy, alsike clover, red clover, Ladino clover, or other plants suited to wet conditions. Grazing should be carefully controlled, particularly during wet or droughty periods.

Management Group IVw–2

This management group consists of only one soil, Jacob clay. This is a very poorly drained, very light colored soil of the bottom lands. It is very slowly permeable and has moderate to low available moisture capacity. Natural fertility is low, and the response to treatment is low.

Although much of the acreage is wooded, this soil can be used to a limited extent for corn, soybeans, wheat, or hay. Yields are likely to be low.

Providing adequate drainage is a major problem. Only surface ditches can be used, and they must be closely spaced to be adequate. Frequent overflow increases the cost of maintaining ditches and limits the choice of crops to those that can be planted in spring.

This soil generally is extremely acid. It is very low in nitrogen and phosphorus and is low in potassium. The use of large amounts of lime and fertilizer is likely to be unprofitable because other factors limit crop yields. Row banding generally is the most economical method of applying fertilizer.

Green-manure crops are needed occasionally to maintain the organic-matter content. These may be soybeans, sudangrass, lespedeza, fescue, or crops that can be planted in spring, if overflow prohibits the use of overwintering grasses and legumes. Additions of organic matter improve tilth and reduce crusting.

This soil may provide limited pasture, but soil treatment and pasture planting ought to be done on a trial basis to determine if such use is economically sound. Use plants suited to wet conditions, such as reed canarygrass or Ladino clover.

Management Group IVw–3

This group consists only of Alluvial land. This land type is composed of deep, variable soils that are not protected by levees and thus are subject to frequent damaging floods. These soils generally are dark colored, and they range from loamy fine sand to silty clay in texture.

Frequent overflow causes deposition, scouring, and channel cutting. Much of this land has been left in natural woodland, and trees are harvested as they mature.

These soils are, for the most part, neutral to calcareous and highly fertile. Good yields of late-planted crops, including corn and soybeans, can be obtained, but the risk of crop loss by flooding is high. Overwintering crops, such as wheat and hay, are not well suited. Plowing, planting, and harvesting have to be done when conditions permit. There are a few high areas, mostly on islands in the Mississippi River, that are flooded less often.

SUBCLASS IVs. SOILS THAT HAVE VERY SEVERE LIMITATIONS BECAUSE OF LOW MOISTURE CAPACITY

Management Group IVs–1

This group consists of deep, well-drained to excessively drained, light-colored loamy fine sands of the Bloomfield and Sarpy series. These soils are on terraces and bottom lands. They are rapidly permeable and have low available moisture capacity. Natural fertility is low, and the response to treatment is low.

Although these soils are droughty, they can be used to a limited extent for corn, soybeans, wheat, hay, and pasture. Green-manure crops and winter cover crops are needed, or a meadow crop ought to be grown at least every other year. If these soils are left bare over winter, they are likely to be damaged by wind erosion. Crop residues left on the soil as trash mulch help to control wind erosion during winter and supply organic matter if plowed under in spring. Fall plowing is not advisable.

Areas of the Sarpy soils not protected by levees are subject to frequent overflow. These areas are not well suited to wheat, hay, or pasture crops.

Sloping areas are subject to slight erosion by water, but green-manure crops and cover crops provide adequate control.

The Sarpy soils are calcareous, and they generally are high in phosphorus and potassium but low in nitrogen. The Bloomfield soils are acid, and they are low in phosphorus, potassium, and nitrogen. These very sandy soils cannot retain nutrients well. Consequently, fertilizer ought to be applied yearly in amounts needed for that year's crop. Larger amounts are likely to be leached away. Adding organic matter by utilizing crop residues, green-manure crops, and cover crops improves the capacity of the soils for retaining plant nutrients and moisture.

Where these soils are used for hay or pasture, they can be seeded with a mixture of tall fescue, orchardgrass, redtop, alfalfa, lespedeza, or other plants suited to droughty conditions.

Class V. Soils that are not likely to erode but have other limitations, impractical to remove, that limit their use largely to pasture, woodland, or wildlife food and cover

SUBCLASS Vw. SOILS TOO WET FOR CULTIVATION; DRAINAGE OR PROTECTION NOT FEASIBLE

Management Group Vw–1

This group consists of deep, poorly drained or somewhat poorly drained, light-colored to moderately dark colored soils that are ponded, or are frequently flooded, or have a high water table for long periods each year. These soils are on bottom lands. Their texture ranges from silt loam to clay. In some areas the water table remains within 6 inches of the surface for more than 6 months of the year. Consequently, the choice of plants is limited.

These soils are too wet or are flooded too frequently to be used for cultivated crops (fig. 14). Most areas are wooded. Some can be used for pasture or for wildlife habitats.

Figure 14.—Darwin silty clay, wet, on Mississippi River bottom lands. If properly drained this class V land could be converted to class III land.

Areas used for pasture can be seeded to plants suited to wet conditions. Reed canarygrass can be seeded in the wettest areas, and alsike clover, Ladino clover, or tall fescue in other areas. Grazing should be carefully controlled, particularly when the soils are wet.

Class VI. Soils that have severe limitations that make them generally unsuitable for cultivation and that limit their use largely to pasture, woodland, or wildlife food and cover

SUBCLASS VIe. SOILS SEVERELY LIMITED, CHIEFLY BY RISK OF EROSION IF PROTECTIVE COVER IS NOT MAINTAINED

Management Group VIe–1

This group consists of deep, well drained and moderately well drained, light-colored, medium-textured soils of the Alford, Muren, Stookey, and Wheeling series. These soils are moderately steep to steep and generally are moderately or severely eroded. They are moderately permeable and have moderate to high available moisture capacity. Runoff is rapid, and the rate of water intake is low because of erosion. Consequently, the moisture supply may not be adequate for best plant growth. Although fertility is medium, all of the soils are low in nitrogen and phosphorus, and the Wheeling soils are likely to be low in potassium. All are acid and need lime.

Because of the steep slopes and severe erosion hazard, these soils are suited only to pasture or woodland. In places the slope is too steep to permit the safe use of machinery for pasture management.

Mixtures of tall fescue, orchardgrass, timothy, lespedeza, alfalfa, Ladino clover, or brome are suitable for seeding in pastures. The removal of sprouts and brush is necessary when pastures are seeded or renovated. Disking several times, if started several months before seeding

time, not only helps to kill undesirable vegetation but also works in lime and fertilizer and leaves a mulch on the surface to help control erosion. Clipping helps to control weeds and brush in established pastures. Grazing should be regulated.

Grassed waterways are difficult to establish because the soils are erodible and runoff is rapid. Special care is needed in designing and constructing waterways, and an investigation at the individual site generally is necessary.

Gullied areas can be used for pasture if bulldozers or other heavy equipment can be used to fill or smooth the gullies. These areas can then be heavily fertilized and seeded with tall fescue and other suitable pasture plants. If smoothing is not practical but the gullies seem to be stabilized, hand seeding early in spring may be adequate. Otherwise, severely gullied areas generally are better suited to black locust and pine or to shrubs suitable for wildlife food and cover.

Management Group VIe–2

In this group are moderately well drained, moderately steep to steep, eroded and severely eroded soils. These soils formed in deep, silty material but their root zone is limited by a slowly permeable fragipan at a depth of 18 to 30 inches. The available moisture capacity is moderate to low, and fertility is also moderate to low.

Because of their steep slopes and susceptibility to erosion, these soils are suited only to pasture or woodland. They are well suited to pasture, unless slopes are too steep to permit the safe use of farm machinery.

Mixtures of fescue, orchardgrass, lespedeza, Ladino clover, or alfalfa are suitable for seeding in pastures, but deep rooting of alfalfa may be restricted by the fragipan. The removal of sprouts and brush is necessary when pastures are seeded or renovated. Disking several times, starting several months before seeding time, not only helps to kill undesirable vegetation but works in lime and fertilizer and leaves a mulch on the surface to help control erosion. Established pastures need to be clipped to control weeds and brush. Grazing should be regulated.

Gullied areas can be used for pasture if bulldozers or other heavy machinery can be used to fill or level the gullies. These areas can then be heavily fertilized and seeded with tall fescue or other suitable grasses. If the gullies cannot be leveled or smoothed, the areas can be hand seeded to grasses, or they can be planted to black locust and pine or to shrubs that provide wildlife food and cover.

Grassed waterways are difficult to establish, because the soils are erodible and runoff is rapid. Special care needs to be taken in designing and constructing waterways, and an investigation at the individual site generally is necessary.

Class VII. Soils that have very severe limitations that make them unsuitable for cultivation without major reclamation and that restrict their use largely to grazing, woodland, or wildlife

SUBCLASS VIIe. SOILS VERY SEVERELY LIMITED, CHIEFLY BY RISK OF EROSION IF PROTECTIVE COVER IS NOT MAINTAINED

Management Group VIIe–1

This group consists of only one soil, Stookey silt loam, 30 to 50 percent slopes. This deep, well-drained, very light colored soil is moderately permeable, has high available moisture capacity, and is moderately fertile. In a few places it is calcareous at a depth of less than 40 inches, but generally it is acid.

Most of this soil is wooded. Pasture crops can be grown, although the slope is generally too steep for the use of farm machinery. Gullied areas can be planted to black locust, redcedar, or pine to check erosion and allow the gullies to heal. Diversion terraces constructed above gully heads will divert water away from gullied areas and thus aid in their stabilization, provided safe outlets are available. If the gullies are small enough to be leveled with a bulldozer, the less sloping areas can be smoothed and seeded to tall fescue or other suitable grasses for pasture. Grazing must be carefully controlled in these areas, however, to prevent further erosion.

SUBCLASS VIIs. SOILS VERY SEVERELY LIMITED BY LOW MOISTURE CAPACITY AND STONINESS

Management Group VIIs–1

This group consists of steep and very steep, light-colored soils of the Bodine and Stookey series. These soils are cherty, stony, or gravelly. They are well drained to somewhat excessively drained and are moderately to rapidly permeable. The deeper, silty Stookey soils have high available moisture capacity and are moderately fertile. The Bodine soils have low available moisture capacity and low fertility. The Stookey soils generally occupy the upper 20 to 80 percent of the slope, and the Bodine soils occupy the rest. The Bodine soils are more common in coves and on west slopes, and in places they are somewhat gravelly on the surface instead of cherty.

Although most areas are wooded, some areas of Stookey soils on the upper part of slopes of less than 30 percent are used for pasture. The pastures are not very productive, however, and grazing must be carefully controlled.

The steep slopes make it impractical to establish or to renovate pastures. Thus, wooded areas should not be cleared for pasture.

General Management of Cultivated Soils

Soils used for cultivated crops need management practices that will maintain or improve their natural fertility, remove excess water, protect them from erosion, and keep them in good tilth.

Fertility.—The soils on bottom lands along the Mississippi and Ohio Rivers are likely to be medium to high in phosphorus and potassium and medium in nitrogen. Almost all of the other soils in Pulaski and Alexander Counties are low in phosphorus and nitrogen and low to medium in potassium, unless these nutrients have been added. For favorable yields of crops, the soils should be tested, and lime and fertilizer applied in amounts indicated by these tests. Consult your farm adviser or a representative of the Soil Conservation Service about taking samples for testing and about applying lime and fertilizer.

Nitrogen fertilizer normally is needed on all of the soils, especially in years of more than average rainfall. Growing legumes frequently in the cropping system will supply part of the nitrogen needed by the other crops. Many of the soils, however, are too acid to produce good yields of legumes. The soils on bottom lands along the Mississippi and Ohio Rivers are neutral to alkaline and may not need lime, but most of the other soils are slightly acid to strongly

acid and need from 2 to 5 tons of lime per acre. The lime should be worked into the soil well in advance of the seeding of legumes.

Alfalfa, sweetclover, and other deep-rooted legumes can be used in the cropping sequence to add organic matter and nitrogen, to improve soil structure, and to increase moisture intake.

Excess water.—Excess water is a problem on many soils in Pulaski and Alexander Counties. The somewhat poorly drained soils generally benefit from artificial drainage during wet seasons, poorly drained soils need complete systems of artificial drainage for best results, and other soils may need only random drainage. Several soils on the bottom lands of the Mississippi and Ohio Rivers are permeable enough to be drained by tile, but some lack outlets. Most of the poorly drained soils are not permeable enough for tile to function satisfactorily, but they can be drained by surface ditches. Consult a representative of your Soil Conservation Service for suitable drainage methods.

Although much of the bottom land along the Mississippi and Ohio Rivers is protected by levees, there are some large unprotected areas that are subject to overflow. In these areas perennial plants or overwintering crops are subject to damage. The same is true of large areas in the Cache River valley. For this reason, many of these areas have been left in woodland. Other areas along creeks or small streams are subject to flash floods. The major damage in these areas is caused by scouring, deposition of new material, and accumulation of debris. Although local relief can be obtained by the use of small levees and diversions, adequate control of overflow commonly involves protection of an entire watershed.

Erosion control.—Soil erosion is a serious hazard on the uplands. The loss of any of the surface soil reduces the supply of organic matter and plant nutrients and causes the soil to be less absorbent. As a result, more water runs off, the rate of erosion increases, and the supply of available moisture decreases.

Runoff causes both sheet and gully erosion. The rate of erosion depends on the amount and intensity of rainfall; on the length and steepness of the slope; on the texture, structure, and permeability of the soil; and on the amount of vegetation.

Wind erosion is not a serious hazard in Pulaski and Alexander Counties. Only a few sandy areas are subject to this kind of damage. These areas can be protected by keeping a growing crop or crop residues on the soils at all times. Rough tillage also helps to keep the soil from blowing.

Estimated Crop Yields

Table 2 gives estimates of average acre yields of the principal crops of Pulaski and Alexander Counties under two levels of management. These estimates are averages for a 10-year period, including years when yields are unusually low as well as some years when yields are unusually high. In columns A are yields to be expected under ordinary management used in this two-county area. In columns B are yields to be expected under high-level management.

Under ordinary management, commercial fertilizer and lime are applied in amounts indicated by soil tests; superphosphate is used on wheat; all crop residues are returned to the soils, barnyard manure is spread, and occasionally a green-manure crop or a meadow crop is plowed under; ordinary cultivation methods, which include plowing, disking, and harrowing, are used, and the soils are cultivated two or three times a year to control weeds; hay mixtures consist mainly of lespedeza and red clover and provide only two cuttings of hay each year; and both drainage and measures to control erosion are inadequate.

Under high-level management, applications of nitrogen, phosphate, potash, and lime correspond to the amounts needed to meet the requirements of corn at the 100-bushel or higher level; cover crops, green-manure crops, and crop residues are used in amounts sufficient to protect the soils; tillage is kept to a minimum, and pre-emergence sprays are used; only suitable varieties of plants and high-quality seed are used; the proper number of plants per acre are grown; nitrogen is used on pastures for early growth in spring; hay is managed for three cuttings a year and is not pastured late in fall; drainage and erosion control measures are adequate; and all operations are timely and are adjusted to the needs of the soils.

TABLE 2.—*Estimated average acre yields of principal crops*

[Yields in columns A are those to be expected under ordinary management; yields in columns B are those to be expected under high-level management. Absence of figures indicates that the crop is not well suited to the soil or that it is not commonly grown]

Map symbols	Soils	Corn		Soybeans		Wheat		Cotton		Mixed hay [1]		Rotation pasture	
		A	B	A	B	A	B	A	B	A	B	A	B
		Bu	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Lb. of lint*	*Lb. of lint*	*Tons*	*Tons*	*Animal-unit-days* [2]	*Animal-unit-days* [2]
308B	Alford silt loam, 2 to 4 percent slopes	60	87	24	35	27	40	490	710	2. 6	4. 0	130	200
308C	Alford silt loam, 4 to 7 percent slopes	58	87	23	35	26	40	470	710	2. 5	4. 0	125	200
308C2	Alford silt loam, 4 to 7 percent slopes, eroded	54	80	22	33	24	37	440	650	2. 4	3. 7	120	185
308D	Alford silt loam, 7 to 12 percent slopes	55	85	22	35	24	40	450	700	2. 4	4. 0	120	200
308D2	Alford silt loam, 7 to 12 percent slopes, eroded	51	80	21	32	23	37	420	650	2. 3	3. 7	115	185
308D3	Alford soils ,7 to 12 percent slopes, severely eroded	47	75	19	30	20	35			2. 0	3. 5	100	175
308E2	Alford silt loam, 12 to 18 percent slopes, eroded	45	78	18	32	21	37			2. 1	3. 7	105	185
308E3	Alford soils, 12 to 18 percent slopes, severely eroded	44	70	17	30	18	35			1. 9	3. 5	95	175
308F	Alford silt loam, 18 to 30 percent slopes											105	185

See footnotes at end of table.

TABLE 2.—*Estimated average acre yields of principal crops*—Continued

Map symbols	Soils	Corn A	Corn B	Soybeans A	Soybeans B	Wheat A	Wheat B	Cotton A	Cotton B	Mixed hay [1] A	Mixed hay [1] B	Rotation pasture A	Rotation pasture B
		Bu	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Lb. of lint*	*Lb. of lint*	*Tons*	*Tons*	*Animal-unit-days* [2]	*Animal-unit-days* [2]
308F2	Alford silt loam, 18 to 30 percent slopes, eroded	----	----	----	----	----	----	----	----	----	----	100	180
308F3	Alford soils, 18 to 30 percent slopes, severely eroded	----	----	----	----	----	----	----	----	----	----	90	170
306	Allison silty clay loam	78	100	30	40	34	44	640	820	3.8	5.2	190	260
455	Alluvial land	(3)	(3)	(3)	(3)	----	----	----	----	----	----	----	----
131A	Alvin fine sandy loam, 0 to 2 percent slopes	57	85	24	35	26	38	460	690	2.3	3.5	115	175
131B	Alvin fine sandy loam, 2 to 4 percent slopes	53	79	22	33	23	35	430	650	2.2	3.3	110	165
131C	Alvin fine sandy loam, 4 to 7 percent slopes	50	75	21	32	22	34	410	630	2.1	3.1	105	155
131C2	Alvin fine sandy loam, 4 to 7 percent slopes, eroded	48	74	20	30	21	33	390	610	2.0	3.0	100	150
131D2	Alvin fine sandy loam, 7 to 12 percent slopes, eroded	43	72	16	29	20	32	350	590	1.9	2.9	95	145
V131	Alvin fine sandy loam, thick A2 horizon variant	53	80	19	31	22	34	430	660	2.1	3.2	105	160
70	Beaucoup silty clay loam	60	90	27	40	26	38	490	740	2.3	4.0	130	200
70+	Beaucoup silty clay, overwash	58	85	25	35	----	----	----	----	----	----	----	----
382	Belknap silt loam	56	85	21	33	22	35	460	700	2.1	3.5	105	175
334	Birds silt loam	50	80	21	32	20	30	410	650	2.0	3.2	100	160
53B	Bloomfield loamy fine sand, 1 to 6 percent slopes	32	50	15	25	16	24	260	410	1.4	2.2	70	120
471G	Bodine cherty silt loam, 30 to 60 percent slopes	----	----	----	----	----	----	----	----	----	----	----	----
108	Bonnie silt loam	46	75	18	30	17	28	380	660	1.8	2.7	90	135
W108	Bonnie silt loam, wet	----	----	----	----	----	----	----	----	----	----	(3)	(3)
108+	Bonnie silty clay loam, overwash	----	----	----	----	----	----	----	----	----	----	(3)	(3)
589A	Bowdre silty clay, 0 to 2 percent slopes	55	80	22	33	19	30	480	660	2.0	3.3	100	165
589B	Bowdre silty clay, 2 to 7 percent slopes	55	80	22	33	19	30	480	660	2.0	3.3	100	165
590A	Cairo silty clay, 0 to 2 percent slopes	55	85	24	35	20	30	500	700	2.0	3.3	100	165
590B	Cairo silty clay, 2 to 4 percent slopes	55	85	24	35	20	30	500	700	2.0	3.3	100	165
W590	Cairo silty clay, wet	----	----	----	----	----	----	----	----	----	----	(3)	(3)
422	Cape and Karnak silty clay loams	45	68	19	28	17	25	370	560	1.7	2.6	85	130
W422	Cape and Karnak silty clay loams, wet	----	----	----	----	----	----	----	----	----	----	(3)	(3)
422+	Cape and Karnak silt loams, overwash	46	70	19	29	17	26	380	570	1.7	2.6	85	130
71A	Darwin silty clay, 0 to 2 percent slopes	50	75	24	35	20	30	470	620	2.0	3.3	100	165
W71	Darwin silty clay, wet	----	----	----	----	----	----	----	----	----	----	(3)	(3)
71C	Darwin silty clay, 2 to 7 percent slopes	46	75	24	35	20	30	420	615	2.0	3.3	100	165
525	Darwin silty clay loam	57	85	24	35	21	33	470	700	2.0	3.3	100	165
266	Disco fine sandy loam	50	80	22	33	22	33	400	650	2.2	3.4	110	170
75D	Drury silt loam, 4 to 12 percent slopes	57	80	24	35	27	38	470	650	2.4	3.7	120	185
180	Dupo silt loam	60	90	23	35	24	37	490	740	2.5	3.8	125	190
475	Elsah silt loam	48	75	20	33	21	33	390	610	2.3	3.5	115	175
460	Ginat silt loam	42	65	19	30	17	27	340	530	1.5	2.5	75	125
162A	Gorham silty clay loam, 0 to 2 percent slopes	75	100	30	40	33	44	620	820	3.5	5.2	175	260
162B	Gorham silty clay loam, 2 to 4 percent slopes	75	100	30	40	33	44	620	820	3.5	5.2	175	260
344	Harvard silt loam	70	95	30	40	32	42	570	780	2.0	4.0	150	200
331	Haymond silt loam	63	92	27	38	28	40	520	750	2.8	4.0	140	200
214B	Hosmer silt loam, 2 to 4 percent slopes	55	80	22	32	25	38	450	650	1.8	3.8	90	190
214C	Hosmer silt loam, 4 to 7 percent slopes	53	77	21	32	24	38	430	630	1.7	3.8	85	190
214C2	Hosmer silt loam, 4 to 7 percent slopes, eroded	44	72	18	28	20	34	360	590	1.4	3.4	70	170
214C3	Hosmer soils, 4 to 7 percent slopes, severely eroded	33	60	13	24	14	28	----	----	1.1	2.8	55	140
214D2	Hosmer silt loam, 7 to 12 percent slopes, eroded	41	70	17	30	18	33	----	----	1.3	3.3	65	165
214D3	Hosmer soils, 7 to 12 percent slopes, severely eroded	31	60	12	22	13	26	----	----	1.0	2.6	50	130
214E2	Hosmer silt loam, 12 to 18 percent slopes, eroded	----	65	----	28	----	30	----	----	1.2	3.2	63	160
214E3	Hosmer soils, 12 to 18 percent slopes, severely eroded	----	----	----	----	----	----	----	----	.9	2.6	45	130
214F2	Hosmer silt loam, 18 to 30 percent slopes, eroded	----	----	----	----	----	----	----	----	----	----	60	155
214F3	Hosmer soils, 18 to 30 percent slopes, severely eroded	----	----	----	----	----	----	----	----	----	----	42	125
338A	Hurst silt loam, 0 to 2 percent slopes	53	70	20	33	20	30	430	570	2.1	3.4	105	170
338B	Hurst silt loam, 2 to 4 percent slopes	43	63	16	30	16	27	350	520	1.6	3.1	88	55
85	Jacob clay	32	50	15	24	14	20	250	400	1.3	2.0	65	100
426	Karnak silty clay	45	65	20	28	17	25	370	530	1.7	2.6	85	130
W426	Karnak silty clay, wet	----	----	----	----	----	----	----	----	----	----	(3)	(3)
175A	Lamont fine sandy loam, 0 to 2 percent slopes	47	70	20	30	20	30	380	570	2.0	3.0	100	150
175B	Lamont fine sandy loam, 2 to 4 percent slopes	40	57	16	25	16	25	330	470	1.6	2.5	80	125
175C	Lamont fine sandy loam, 4 to 7 percent slopes	36	55	15	24	15	24	290	450	1.5	2.4	75	120
304A	Landes fine sandy loam, 0 to 2 percent slopes	47	70	22	30	25	36	380	570	2.9	4.2	145	210

See footnotes at end of table.

TABLE 2.—*Estimated average acre yields of principal crops*—Continued

Map symbols	Soils	Corn		Soybeans		Wheat		Cotton		Mixed hay [1]		Rotation pasture	
		A	B	A	B	A	B	A	B	A	B	A	B
		Bu	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Lb. of lint*	*Lb. of lint*	*Tons*	*Tons*	*Animal-unit-days* [2]	*Animal-unit-days* [2]
304B	Landes fine sandy loam, 2 to 6 percent slopes	47	70	22	30	25	36	380	570	2.9	4.2	145	210
467C3	Markland soils, 4 to 12 percent slopes, severely eroded	12	26	10	20	10	20	100	220	1.0	2.0	50	100
219	Millbrook silt loam	63	90	25	38	25	38	520	740	2.6	4.0	130	200
453C	Muren silt loam, 2 to 7 percent slopes	54	80	22	34	25	38	440	660	2.8	4.0	140	200
453D2	Muren silt loam, 7 to 12 percent slopes, eroded	47	73	19	32	22	33	380	600	2.5	3.7	125	185
453D3	Muren soils, 7 to 12 percent slopes, severely eroded	43	68	18	30	20	26	350	560	2.1	3.5	105	175
453E2	Muren silt loam, 12 to 18 percent slopes, eroded	45	72	18	32	21	30	---	---	2.2	3.6	110	180
453E3	Muren soils, 12 to 18 percent slopes, severely eroded	---	---	---	---	---	---	---	---	2.1	3.4	105	170
453F3	Muren soils, 18 to 30 percent slopes, severely eroded	---	---	---	---	---	---	---	---	---	---	100	170
161	Newart silt loam	75	100	30	40	34	44	620	820	2.6	5.2	130	260
84	Okaw silt loam	40	63	16	28	15	25	330	520	1.5	2.5	75	125
401	Okaw silty clay loam	30	50	15	23	15	20	250	410	1.4	2.2	70	110
288	Petrolia silty clay loam	53	80	22	35	20	30	430	660	2.1	3.2	105	160
W288	Petrolia silty clay loam, wet	---	---	---	---	---	---	---	---	---	---	(3)	(3)
420	Piopolis silty clay loam	46	70	19	29	17	26	370	570	1.8	2.7	90	135
W420	Piopolis silty clay loam, wet	---	---	---	---	---	---	---	---	---	---	(3)	(3)
109	Racoon silt loam	47	74	18	30	20	30	390	610	2.0	3.0	100	150
452A	Riley silty clay loam, 0 to 2 percent slopes	58	85	24	35	26	40	480	700	2.4	4.5	120	225
452B	Riley silty clay loam, 2 to 4 percent slopes	57	85	84	35	26	40	470	700	2.4	4.5	120	225
452C	Riley silty clay loam, 4 to 7 percent slopes	54	85	22	35	23	40	440	700	2.2	4.5	110	225
184A	Roby fine sandy loam, 0 to 2 percent slopes	53	80	21	35	24	36	430	650	2.3	3.6	115	180
184B	Roby fine sandy loam, 2 to 4 percent slopes	50	80	20	35	23	36	410	650	2.3	3.6	115	180
178	Ruark fine sandy loam	40	62	18	28	18	28	330	510	1.8	2.8	90	140
92	Sarpy loamy fine sand	32	50	15	25	16	24	250	400	1.3	2.0	65	100
462A	Sciotoville silt loam, 0 to 2 percent slopes	62	90	27	39	27	38	510	740	2.7	4.0	135	200
462B	Sciotoville silt loam, 2 to 4 percent slopes	56	84	24	36	24	36	460	690	2.4	3.7	120	185
462C2	Sciotoville silt loam, 4 to 7 percent slopes, eroded	50	78	22	33	22	33	410	640	2.2	3.4	110	170
462C3	Sciotoville soils, 4 to 7 percent slopes, severely eroded	45	71	20	30	20	30	370	580	2.0	3.1	100	155
462D2	Sciotoville silt loam, 7 to 12 percent slopes, eroded	46	76	20	33	20	32	380	620	2.0	3.4	100	170
462D3	Sciotoville soils, 7 to 12 percent slopes, severely eroded	42	70	18	30	18	29	340	570	1.8	3.0	90	150
72	Sharon silt loam	60	90	23	35	28	40	490	740	2.6	4.0	130	200
216E	Stookey silt loam, 12 to 18 percent slopes	60	80	27	35	29	38	---	---	2.7	3.7	135	185
216F	Stookey silt loam, 18 to 30 percent slopes	---	---	---	---	---	---	---	---	---	---	130	185
216F3	Stookey silt loam, 18 to 30 percent slopes, severely eroded	---	---	---	---	---	---	---	---	---	---	110	170
216G	Stookey silt loam, 30 to 50 percent slopes	---	---	---	---	---	---	---	---	---	---	---	---
990F	Stookey-Bodine complex, 18 to 30 percent slopes	---	---	---	---	---	---	---	---	---	---	---	---
990G	Stookey-Bodine complex, 30 to 60 percent slopes	---	---	---	---	---	---	---	---	---	---	---	---
164A	Stoy silt loam, 0 to 2 percent slopes	53	80	21	35	25	38	430	660	2.4	3.6	120	180
164B	Stoy silt loam, 2 to 4 percent slopes	45	65	18	28	21	31	370	530	2.0	3.0	100	150
284A	Tice silty clay loam, 0 to 2 percent slopes	74	100	29	40	28	42	610	820	3.6	5.2	180	260
284B	Tice silty clay loam, 2 to 4 percent slopes	74	100	29	40	28	42	610	820	3.6	5.2	180	260
284+	Tice silty clay, overwash	60	90	30	40	21	33	490	730	2.0	3.2	100	160
333	Wakeland silt loam	59	88	24	35	24	35	480	720	2.5	3.8	125	190
456A	Ware silt loam, 0 to 2 percent slopes	56	85	23	35	25	40	460	700	2.4	4.5	120	225
456B	Ware silt loam, 2 to 4 percent slopes	56	85	23	35	25	40	460	700	2.4	4.5	120	225
461A	Weinbach silt loam, 0 to 2 percent slopes	50	75	20	34	21	31	410	610	2.2	3.3	110	165
461B	Weinbach silt loam, 2 to 4 percent slopes	50	75	20	34	21	31	410	610	2.2	3.3	110	165
165	Weir silt loam	46	72	18	31	20	30	380	590	2.0	3.0	100	150
463A	Wheeling silt loam, 0 to 2 percent slopes	65	95	30	43	30	42	530	780	2.7	4.0	135	200
463B	Wheeling silt loam, 2 to 4 percent slopes	60	90	27	41	27	40	490	740	2.4	3.7	120	185
463C2	Wheeling silt loam, 4 to 7 percent slopes, eroded	52	82	24	37	24	36	430	670	2.2	3.4	110	170
463E3	Wheeling soils, 12 to 18 percent slopes, severely eroded	40	75	18	34	18	34	---	---	1.8	3.0	90	150

[1] Hay and pasture yields are estimated for mixed stands of grasses and legumes adapted to the soil. For the kinds of hay and pasture to grow, see your local soil conservationist or farm advisor.

[2] The number of days 1 acre will carry 1 animal unit, such as 1 cow, 2 yearling cattle; 1 horse; 5 sheep; or 4 brood sows. 2½ tons of mixed hay equal 120 animal-unit-days.

[3] Variable.

The estimates of yields are based on data from experiments made by the Illinois Agricultural Experiment Station and on the experience of farmers, agronomists, and conservationists. If data were lacking, yields were estimated by using a formula in which the effects of erosion and slope were considered.[3] Differences in weather may cause variations of as much as 20 percent from the estimates. Under a very high level of management, yields may be considerably higher.

Cotton needs a 200-day growing season, and Pulaski and Alexander Counties are close to the northern limit at which it can be grown. Thus, climate, rather than soil, may be the factor that limits cotton yields.

Use of the Soils for Fruits and Vegetables [4]

Pulaski and Alexander Counties are at the edge of the vegetable- and fruit-producing area of southern Illinois. Many of the soils have been used for these purposes, but in recent years most of the farmland has been used for other crops. With the growth in population, increased demands for fresh produce may make the growing of both fruits and vegetables, but particularly vegetables, an increasingly important farm enterprise in these counties.

Several factors affect the use of the soils for fruits and vegetables and the choice of the crop to be grown. These include ease of preparing seedbeds, available moisture capacity, rooting depth, erosion hazard, acidity and fertility, and potential for irrigation. This section groups the soils of the two-county area according to their suitability for fruits and vegetables. These groups reflect the kind and intensity of problems that may be encountered, but they do not necessarily imply differences in yields, although higher yields generally can be expected from the more favorable groups than from the less favorable ones.

Although air drainage is not a soil property, it is an important factor in fruit production. Therefore, insofar as possible, air drainage was considered in classifying the soils into groups. Air drainage is difficult to assess, however, on terraces and on the large bottom lands along the Mississippi River. Generally, an examination of the site is necessary. For example, some areas of the soils in groups 1 and 2 occur on foot slopes where air drainage is poor. These areas are less favorable for fruits than other areas of the same soils.

In grouping the soils, it was assumed (1) that the soils are to be used for the commercial production of fruits and vegetables; (2) that the fertility needs of the soils for the specified fruits and vegetables will be determined by soil tests and adequately met, although fertility needs were not considered in grouping the soils; and (3) that irrigation will be used. With special care that cannot be evaluated here, many of the fruits and vegetables not suited to commercial production can be grown successfully in home gardens and orchards.

The growing season in Pulaski and Alexander Counties is long. Thus, the well-drained soils are favorable for the production of early season and late season crops. Some fruits and vegetables are not well suited because of the long periods of hot, dry weather that occur during the summer season. Only those fruits and vegetables climatically suited are mentioned in the discussion of the groups. Vegetables that require a cooler climate are broccoli, brussels sprouts, carrots, cauliflower, celery, endive, lettuce, lima beans, parsnips, peas, potatoes, onions, and radishes. These vegetables can be produced under special conditions, or they can be grown in home gardens, but they are not well suited to commercial production. Cherries also require a cooler climate.

Certain crops are not grown at the present time in this area because disease-prevention measures have not been employed. This is true of pears, asparagus, and rhubarb. Asparagus and rhubarb are mentioned in the event that control measures are employed. Pears are not discussed, but they can be grown under conditions similar to those needed for apples.

Flowers have been produced commercially in the past. Peonies, daffodils, and gladioli have been grown for direct shipment to the large cities.

The "Guide to Mapping Units" at the back of this survey shows which fruit and vegetable group each soil in Pulaski and Alexander Counties has been placed in.

FRUIT AND VEGETABLE GROUP 1

In this group are deep and moderately deep, well drained and moderately well drained, moderately and slowly permeable soils of the Alford, Hosmer, and Muren series. These soils are on gently sloping uplands. They have high or moderately high available moisture capacity, are medium or strongly acid, and are moderately fertile. Good tilth is easily maintained.

The soils of this group are well suited to both fruits and vegetables. They can be used for acid-tolerant crops, such as sweetpotatoes, raspberries, and blackberries. At a depth of 24 to 36 inches, the Hosmer soils have a compact layer that restricts the depth of their root zone and limits their available moisture capacity. Consequently, they are not so well suited to deep-rooted crops as the other soils in this group.

Most of these soils are on ridgetops where air drainage is good. The cooler north slopes are somewhat better suited to fruit crops than the south slopes, because blossoming is more likely to be delayed until the danger of frost is past. In Alexander County, the Hosmer soils are on foot slopes where air drainage is poor.

These soils are friable and are easily worked. Organic matter in the form of cover crops, mulches, and manure helps to maintain good tilth. These soils are well suited to irrigation, but an adequate supply of water for this purpose is difficult to obtain. Ponds can be used if sites of suitable capacity are available. Deep wells are an undependable source of water, and even if the supply were adequate, dissolved minerals in the water would cause a problem in sprinkler irrigation. The section "Use of the Soils for Engineering" gives more detailed information on irrigation.

All of the soils in this group are subject to erosion because of the slope. Erosion can be controlled by farming on the contour, by terracing, and by growing winter cover crops in cultivated fields and cover crops in orchards. More information on control of erosion is given in the

[3] Hay and pasture yields are estimated for mixed stands of grasses and legumes suited to the soils.

[4] FRED B. ALCORN, work unit conservationist, Soil Conservation Service, Anna, Ill., assisted in the preparation of this section. Suggestions by J. S. VANDEMARK, Department of Horticulture, University of Illinois, Urbana, Ill., were also used.

discussion of management groups IIe–1, IIe–2, and IIIe–2, under the heading "Management by Groups of Soils."

FRUIT AND VEGETABLE GROUP 2

This group consists of strongly sloping soils of the Alford, Drury, Hosmer, and Muren series. These soils are on uplands. The Hosmer soils are moderately deep, moderately well drained, and slowly permeable; they have a fragipan at a depth of 20 to 30 inches. All the other soils are deep, well drained, and moderately permeable. The severely eroded soils of this group have a less porous surface layer, have poorer tilth, and are more difficult to work than the other soils, and they dry out more quickly and crust more readily. Also, runoff is greater, and the intake of moisture is likely to be lower.

Intensive management is needed if the soils of this group are used for vegetables. Where fields are tilled on the contour, vegetables can be grown for 1 year in 3 years on slopes of 4 to 7 percent, if a meadow crop is grown for 1 year, and they can be grown for 1 year in 4 years on slopes of 7 to 12 percent, if a meadow crop is grown for 2 years. The use of cover crops and mulches adds organic matter to the soils and improves their tilth, porosity, and available moisture capacity. Other suggestions for management are given in the discussions of management groups IIIe–1, IIIe–2, IVe–1, and IVe–2, under the heading "Management by Groups of Soils."

Strawberries, which are ridged and heavily mulched with straw, can be planted on the contour to help control erosion. Fruit trees are suitable if planted on the contour and if a sod cover crop is used. On steep slopes the possibility of spreading such soil-borne diseases as red stele of strawberries is increased if runoff is not controlled.

These soils occur mainly on ridgetops and on long slopes where air drainage generally is good. The later blossoming of fruits on the cooler north slopes reduces the risk of frost damage. In Alexander County, the Hosmer and Drury soils occur on foot slopes, where air drainage is poor.

The soils of this group are suited to irrigation. In most places ponds must be used to supply the water needed, and sites for ponds of adequate capacity are not everywhere available. The low or moderate rate of infiltration and the strong slopes cause surface runoff unless the rates of application are carefully controlled. These soils have moderate or high available moisture capacity if properly managed, but they dry out quickly, and they crust readily if left bare.

FRUIT AND VEGETABLE GROUP 3

This group includes all of the soils in Pulaski and Alexander Counties that have a gradient of more than 12 percent. These soils occupy slopes of 12 to 60 percent or more, and they range from slightly eroded to severely eroded, or gullied. Some are shallow and cherty.

Because of the steep slopes and the hazard of erosion, the soils of this group are not suited to fruits or vegetables. Tree fruits are grown in some places on slopes of up to 18 percent, with a permanent sod cover crop, but the risk of soil loss is great.

FRUIT AND VEGETABLE GROUP 4

This group consists of moderately well drained and well drained soils of the Harvard, Sciotoville, and Wheeling series. These soils are on terraces. They are moderately and moderately slowly permeable, have high available moisture capacity, and are moderately fertile. They are easily worked and easily kept in good tilth. Although most of these soils are in level to gently sloping areas, some occupy short strong slopes and are slightly to severely eroded.

The soils in this group are suited to most fruits and vegetables. They are strongly acid, and all except the Harvard soils are low in nitrogen, phosphorus, and potassium.

These soils are on low, narrow to broad ridges, principally on old flood plains of the Cache River. They are from 3 to 10 feet, or more, higher than adjacent soils on bottom lands and consequently may have slightly better air drainage. This advantage is often nullified, however, by the surrounding areas of woodlands, which tend to inhibit air flow.

Organic matter in the form of cover crops, mulches, and manures aids in maintaining good tilth. Soils on slopes of more than 2 percent need to be protected from erosion. Erosion can be held to a minimum by farming on the contour, by using winter cover crops if vegetables are grown, by using permanent cover crops in orchards, and by using sod strips with small fruits. On slopes of 7 to 12 percent, a suitable rotation is one that includes vegetables only 1 year in 4 years and a meadow crop for 2 years. Orchards on slopes of 7 to 12 percent need a permanent cover crop to control erosion. More information on control of erosion is given in the discussions of management groups IIe–1, IIIe–1, and IVe–1, under the heading "Management by Groups of Soils."

These soils have a medium rate of infiltration, and they have high available moisture capacity. Consequently they are well suited to irrigation. An adequate supply of water generally is available in the underlying thick strata of sand and gravel.

FRUIT AND VEGETABLE GROUP 5

This group consists of soils of the Hurst, Markland, Millbrook, Roby, Stoy, and Weinbach series. All except the Markland soil are deep, somewhat poorly drained, and slowly permeable. The Markland soil is moderately well drained, and it is only moderately deep because of a calcareous substratum, which restricts the growth of roots. All of these soils are low in fertility, and all except the Roby soils have moderate to moderately high available moisture capacity. The Roby soils are moderately low in available moisture capacity. The response to treatment is moderate.

The choice of crops is limited, and yields are likely to be lower than on the better drained soils that are higher in fertility. Beets, asparagus, rhubarb, and other early season crops will not grow well because these soils are wet early in spring. Spinach, cucumbers, and peppers are suitable, particularly if planting can be delayed until the soils have dried out.

Tree fruits are not well suited, because their roots are affected by wetness. Strawberries, blackberries, and raspberries, which have a shallower rooting system, are more tolerant of wet conditions and thus are better suited. Slopes of less than 2 percent may not have adequate surface drainage to be suited to strawberries.

Surface ditches can be used in level areas to improve drainage. Contour farming, mulches, and cover crops help to control erosion on slopes. On slopes of 4 to 7 percent, vegetables can be grown in a rotation that includes a meadow crop once in 3 years. Further information on erosion control on these soils is given in the discussions of management groups IIw–1, IIs–1, IIIe–3, and IVe–3, under the heading "Management by Groups of Soils."

The organic-matter content of these soils is low. It can be increased by the use of manures, mulches, and winter cover crops. Additions of nitrogen, phosphate, and potash are also needed. All of the soils are strongly acid and need lime. The Markland soils are calcareous at a depth of less than 40 inches, are severely eroded, and have poor tilth. Their surface layer is less porous than that of the other soils and generally is very heavy and difficult to till.

An adequate supply of water for irrigation generally can be obtained from underground sources in all but the Stoy soils. On the Stoy soils, farmers may have to depend on ponds as a source of water for irrigation. The Roby, Stoy, and Weinbach soils have a slow or moderately slow rate of infiltration and have moderate available moisture capacity, but both infiltration and available moisture capacity can be improved somewhat by additions of organic matter. The Hurst soils have a slow rate of infiltration and have low available moisture capacity. Irrigation of these soils is of questionable value. The Markland soils have a very slow rate of infiltration and, therefore, are not suited to irrigation. For further information on irrigation, refer to the section "Use of the Soils for Engineering."

FRUIT AND VEGETABLE GROUP 6

In this group are deep, poorly drained, slowly to very slowly permeable soils of the Ginat, Okaw, Racoon, Ruark, and Weir series. In places a claypan at a depth of 20 to 30 inches restricts the movement of water. The available moisture capacity is medium to low, natural fertility is low, and the response to treatment is medium to low. Low fertility, combined with wetness late in spring and droughtiness in summer, makes these soils unsuitable for most fruits and unfavorable for many vegetables.

Fair to good yields of suitable vegetables can be obtained if these soils are adequately drained, limed, fertilized, and irrigated. Surface ditches can be used to provide drainage. Wetness late in spring, however, may delay planting and prevent use of these soils for early season crops. These soils are strongly acid to extremely acid, and they generally require lime if vegetables are grown. Moderate to large amounts of nitrogen, phosphate, and potash are also needed. Snap beans can be grown only if these soils are drained and crusting is minimized. Additions of organic matter help to improve tilth and to prevent crusting. Blackberries are the only fruit tolerant enough of wet conditions to be suitable.

Because of their low moisture reserve, these soils are droughty in midsummer. An adequate supply of water for irrigation generally is available, however, in underground sources in the Cache River valley. On the Weir soils, farmers must depend on ponds as a source of water for irrigation, and pond sites of adequate capacity are scarce. Further information on irrigation is given in the section "Use of the Soils for Engineering."

FRUIT AND VEGETABLE GROUP 7

The soils in this group are deep, well-drained, moderately permeable fine sandy loams of the Alvin series. They are moderately fertile, respond well to treatment, and are medium to strongly acid. Because of their high content of sand they do not hold enough moisture for best plant growth, but they are easy to work and to keep in good tilth.

The soils in this group are suited to both fruits and vegetables. Sandy soils dry out quickly in spring, warm up early, are easily worked, and are suitable for early crop production. Although yields may be better on other soils, these soils can be used for the earlier production of snap beans, cucumbers, peppers, muskmelons, rhubarb, and spinach. They are especially well suited to asparagus, muskmelons, and watermelons. Tree fruits and small fruits can be grown, but small fruits require heavy applications of organic matter. These soils are from 5 to 10 feet above the adjacent bottom lands, and they generally have better air drainage than the bottom-land soils. This advantage is often nullified, however, by the surrounding woodlands, which tend to inhibit air flow.

These soils have a moderately high rate of infiltration and medium available moisture capacity. Irrigation is feasible and generally is necessary if small fruits and vegetables are grown. Water for irrigation normally can be obtained from underground sources. For further information on irrigation, refer to the section "Use of the Soils for Engineering."

Organic matter in the form of cover crops, mulches, and manures aids in maintaining tilth and in increasing the available moisture capacity. Erosion control measures generally are needed on slopes of 4 to 12 percent. Farming on the contour and the inclusion of a winter cover crop in the rotation helps to prevent soil loss. Control of erosion on these soils is discussed more fully in the descriptions of management groups IIe–3 and IIIe–1, under the heading "Management by Groups of Soils."

FRUIT AND VEGETABLE GROUP 8

In this group are deep, well drained to excessively drained, rapidly permeable and moderately rapidly permeable sandy soils of the Bloomfield, Disco, Lamont, and Sarpy series. The available moisture capacity is low, fertility is low, and the response to treatment is low to moderate. These soils are limited in their suitability for fruits and vegetables because of low fertility and droughtiness. The Sarpy soils are further limited because they are calcareous.

Muskmelons and watermelons are particularly well suited to these soils. Fair to good yields of other vegetables can be obtained, particularly cucumbers, asparagus, spinach, peppers, and rhubarb grown for early marketing. These soils are less favorable for midseason production of these vegetables. They are less favorable for all fruits and are not suited to blueberries.

These soils are too sandy to retain moisture. Consequently, they become droughty early in summer. An adequate supply of water for irrigation generally can be obtained from underground sources, but since these soils are porous and have low available moisture capacity, irrigation water must be applied frequently and in moderate amounts. The Disco and Lamont soils have somewhat higher available moisture capacity than the Bloomfield

and Sarpy, and thus are more productive. For additional information concerning irrigation refer to the section "Use of the Soils for Engineering."

The Sarpy soils are calcareous and are not highly productive. The other soils are acid and ordinarily need lime. Nitrogen, phosphate, and potash are also needed. Very sandy soils do not retain nutrients well, and fertilizer ought to be applied yearly in amounts needed for one year's crop. Organic matter in the form of manures, mulches, and cover crops helps to preserve tilth, to increase the available moisture capacity, and to prevent wind erosion.

FRUIT AND VEGETABLE GROUP 9

This group consists of deep, well drained to moderately well drained, moderately permeable silt loams of the Elsah, Haymond, and Sharon series. These soils occur on narrow, small to medium-sized areas of bottom lands and are subject to occasional overflow. They are moderately to highly productive and are slightly to strongly acid. They respond well to treatment. The available moisture capacity is high in the Sharon and Haymond soils but is moderate in the Elsah soils because of a cherty substratum. All of the soils in this group are easy to work and are easy to keep in good tilth.

These soils are not well suited to fruits. They generally are suitable for vegetables and are often used for spinach, cucumbers, peppers, and tomatoes. Acidity must be corrected by liming, and proper fertilization is necessary.

These small to medium-sized areas of bottom lands are surrounded by hills. Consequently, air drainage is poor. For this reason, peaches are not suited, and strawberries are subject to frost damage. Other fruits can be grown with moderate success, and pecans and walnuts are suitable.

These soils are well suited to irrigation. They have a moderate to high rate of infiltration, and the Sharon and Haymond soils have high available moisture capacity. The Elsah soil varies in its capacity to hold water. Ponds may have to be used to supply water for irrigation because an adequate supply of water may not be readily available. For further information on irrigation, refer to the section "Use of the Soils for Engineering."

FRUIT AND VEGETABLE GROUP 10

In this group are somewhat poorly drained, deep, moderately slowly permeable silt loams of the Belknap, Dupo, and Wakeland series. These soils are on bottom lands that commonly are flooded in spring. They are moderately productive and respond well to treatment. The soils of this group are less favorable for fruits and vegetables than those of group 9 because of their somewhat poor drainage and the greater probability of overflow. Otherwise, they are similar.

The Belknap and Dupo soils generally are strongly acid, and the Wakeland soils are slightly acid. These soils are suited to a wide range of vegetables if they are properly drained, are protected from overflow, and are limed and fertilized.

As a rule, tree fruits are not grown, because their roots are affected by wetness. Strawberries, blackberries, and raspberries are better suited because they have a shallow root system and generally require large amounts of water. Most of these soils occur as small to medium-sized areas of bottom lands surrounded by hills. Consequently, air drainage generally is poor. Peaches grown in these areas are especially subject to frost damage, and strawberries may also be damaged.

The major problems are to provide adequate drainage and to control overflow. In many places surface ditches are needed to drain the soils adequately for early crops. Diversion ditches or terraces can be used to intercept runoff from adjacent hills, and small levees help to prevent overflow in spring.

Irrigation can be used if sites of adequate capacity are available for ponds. These soils have a moderately slow rate of infiltration, but this rate can be increased if the organic-matter content is increased through the use of cover crops, mulches, and manures. All the soils in this group have high available moisture capacity. For further information on irrigation, refer to the section "Use of the Soils for Engineering."

FRUIT AND VEGETABLE GROUP 11

In this group are silt loams of the Birds, Bonnie, Cape, and Karnak series and areas of Alluvial land, on bottom lands. Alluvial land varies considerably in soil properties but is included in this group because it is subject to overflow. The other soils are deep, poorly drained, and slowly permeable. They are moderate to high in available moisture capacity and are low to medium in fertility. The response to treatment is moderate.

Because of the serious hazard of overflow, Alluvial land is suited only to vegetables that can be planted late in the season, after the danger of flooding is past. Vegetables tolerant of a neutral or calcareous soil should be grown. Alluvial land is poorly suited to fruits because it is wet and is subject to overflow.

The other soils in this group are likely to be wet until late in spring and are also subject to overflow. Thus, they are not suited to early season crops, for example, beets, rhubarb, and spinach. If drained, however, they can be used for snap beans, turnips, cucumbers, tomatoes, and other vegetables. They generally are not suited to fruits. Surface ditches are an aid in draining these soils, and diversion ditches can be used to intercept runoff from adjacent hills. Small levees help to prevent overflow. There are some wet spots on the Birds soils that need to be used and managed in the same way as the soils in group 15. These areas are indicated on the detailed soil map by wet-spot symbols.

These soils are neutral to strongly acid and are low in nitrogen, phosphorus, and potassium. They are also low in organic-matter content and crust easily. To improve tilth and reduce crusting, organic matter can be added in the form of manures, mulches, and cover crops.

On bottom lands along the Cache River, water for irrigation ordinarily can be obtained from underground sources. On creek bottoms, however, water for irrigation generally is scarce, since ponds are the principal source of supply. The Bonnie and Birds soils have a slow rate of infiltration and have medium available moisture capacity. For further information on irrigation, refer to the section "Use of the Soils for Engineering."

FRUIT AND VEGETABLE GROUP 12

This group consists of deep, somewhat poorly drained to well-drained, dark-colored silt loams and fine sandy loams of the Newart, Landes, and Ware series. These soils

are on bottom lands along the Mississippi River. They are moderately permeable to moderately rapidly permeable and have moderate to high available moisture capacity. They are productive and respond well to treatment.

The soils in this group warm up early in spring, are easily worked, and have a long growing season. They are suited to a wide variety of vegetables. Areas that are protected by levees can be used for fruits, although the Landes and Ware soils are somewhat droughty. Fruits may be damaged if grown in unprotected areas that are subject to overflow. All of these soils are suited to pecans and walnuts.

These soils are neutral in reaction and are high in phosphorus and potassium. They are not likely to require lime but may need to be made acid for some vegetables, particularly sweetpotatoes and watermelons. Watermelons can be grown on the Landes soils if the soil reaction is satisfactory.

The Newart soils tend to be somewhat wet, and some areas will be benefited by drainage. The Landes and Ware soils are shallow to sand and tend to be somewhat droughty.

Water for irrigation can be obtained readily from underground sources. Infiltration is medium in all of the soils of this group. The available moisture capacity is high in the Newart soils and medium in the Landes and Ware soils. Refer to the section "Use of the Soils for Engineering" for further information on irrigation.

FRUIT AND VEGETABLE GROUP 13

This group consists of deep, poorly drained to well-drained, dark-colored silty clay loams of the Allison, Gorham, Riley, and Tice series. These soils occur on bottom lands of the Mississippi and Ohio Rivers. Although they are productive and respond well to treatment, they are less favorable for fruits and vegetables than the soils in group 12 because of their wetness and heavy texture.

Where drainage is adequate, such vegetables as snap beans, sweet corn, cucumbers, tomatoes, and peppers can be grown. Soil reaction is likely to be too high for sweetpotatoes and spinach, which are best suited to more acid soils. Asparagus and root crops, such as beets and turnips, may be deformed if the soil becomes hard and dry. Fruits do less well on these soils than on the soils of group 12. They may be damaged if grown in areas that are not protected from overflow. Pecans and walnuts are well suited.

These soils tend to warm up fairly early in spring, and they have a long growing season. They are slightly acid to slightly alkaline and are highly fertile. Lime and fertilizer may not be needed in all areas.

Surface ditches and tile can be used in most areas where drainage is needed. Tile may not function satisfactorily in the Riley soils, which are shallow to sand. If used in these soils, it should be carefully installed. If plowed in spring, these moderately fine textured soils are likely to become cloddy. Fall plowing generally is preferable. To help maintain good tilth and to keep the soils porous, organic matter can be added in the form of manures, mulches, and green-manure crops.

Water for irrigation can be obtained readily from underground sources. The soils of this group have a medium rate of infiltration, and all except the Riley soils have high available moisture capacity. The Riley soils are underlain by sand and thus are medium in available moisture capacity. The section "Use of the Soils for Engineering" gives additional information on irrigation.

FRUIT AND VEGETABLE GROUP 14

This group consists of poorly drained to very poorly drained clayey soils of the Beaucoup, Bowdre, Cape, Cairo, Darwin, Jacob, Karnak, Petrolia, Piopolis, and Tice series. These soils are on bottom lands. All are slowly permeable or very slowly permeable except the Beaucoup, which are moderately slowly permeable. They are low to moderate in available moisture capacity and are low to high in fertility. The response to treatment ranges from low to high.

These wet soils are not suited to either tree fruits or small fruits, and they generally are not favorable for vegetables. They are difficult to cultivate and tend to pack and become cloddy when tilled. Seedbeds fine enough for small vegetable seeds are difficult to prepare. If vegetables are grown, however, fall plowing is desirable. Asparagus and root crops commonly are deformed because the soils crack and become hard when dry. Therefore, such crops cannot be produced commercially. There are some wet spots on the Jacob soil that need to be used and managed in the same way as the soils in group 15. These spots are indicated on the detailed soil map by wet-spot symbols.

The Beaucoup, Bowdre, Cairo, Darwin, and Tice soils are neutral in reaction and are highly fertile. The Jacob, Karnak, Petrolia, and Piopolis soils are slightly acid to extremely acid and are low in fertility.

Water for irrigation is obtained readily from underground sources in the Cache River and Mississippi River valleys. These soils, however, have a slow rate of infiltration, and they absorb large amounts of water before any is available to plants. Therefore, the use of irrigation is of questionable value.

FRUIT AND VEGETABLE GROUP 15

This group consists of soils on bottom lands that are frequently overflowed or ponded. These soils remain wet too late in the season to be suited to any fruits or vegetables.

If these soils were drained adequately and protected from overflow, they would be in group 10, 11, 13, or 14.

Use of the Soils for Woodland [5]

Forest covered all of the uplands and most or all of the bottom lands of Pulaski and Alexander Counties prior to the time of settlement. The early settlers cleared the land rapidly and planted the rolling hills. As fertility declined and erosion took its toll, the poorest areas were abandoned. Other areas, too steep to plow, were cut over extensively, and most of the good timber was removed. Thus, by 1930 much of the woodland was in poor condition.

In 1933, the Shawnee National Forest was established. It now includes 24,689 acres in Alexander County. This land is rapidly being returned to full productivity as woodland. In addition, there are approximately 57,000 acres of woodland on private farms throughout the two counties. The nearly 82,000 acres of woodland make up about 30 percent

[5] L. S. MINCKLER, research forester, Illinois Forest Research station, U.S. Forest Service, Carbondale, Ill.; EDWARD H. HANSES, farm forester, Division of Forestry, Illinois Department of Conservation, Anna, Ill.; and WILLIAM S. BOGGESS, Department of Forestry, University of Illinois, assisted with the preparation of this section.

of the two-county area. Of this, 9 percent is in Pulaski County, and 21 percent is in Alexander County. By 1975 this acreage is expected to decrease slightly, perhaps by 2,000 acres, but this small decrease will be more than offset by the increased quality of the woodlands (*26*).

The trees now grown in the greatest quantities for local markets are red oak, white oak, black oak, pin oak, ash, sweetgum, tulip-poplar (fig. 15), cottonwood, soft maple, hickory, and sycamore. Several other species of oak are grown in smaller quantities, and small amounts of other hardwoods are sold. Several plantations of shortleaf and loblolly pine have been established, and there are a few plantings of Scotch pine for Christmas trees. Markets in or near the area include a pulpwood chipping plant, three box and basket factories, four large and several small sawmills, and several buyers of materials for special products, including staves, ski blanks, charcoal, veneer, and piling.

***Figure 15.*—Tulip-poplar growing on Alford silt loam, 4 to 7 percent slopes, which is in woodland group 2.**

Soil-woodland interpretations

The soils of Pulaski and Alexander Counties have been placed in 13 woodland suitability groups on the basis of soil characteristics that affect the production of timber. In table 3, the groups are described briefly, both site index and average annual growth in board feet are given, and the limitations and hazards that affect the use of the soils for woodland are rated. Also shown are preference ratings for trees in existing stands and for species suitable for planting.

Information is given in table 3 both for cool sites and for hot sites within each group that is made up of sloping or steep soils on uplands.

Cool sites include the lower two-thirds of all north, northwest, northeast, and east slopes; slopes of less than 12 percent on ridgetops more than about 600 feet wide or on gently rolling terrain; and coves, foot slopes, and bottom lands.

Hot sites include all southeast, south, southwest, and west slopes of more than 12 percent; narrow ridgetops less than 600 feet wide; and the upper third of the northerly and easterly slopes of the ridges. Moisture evaporates more rapidly, leaf litter decays more readily, and productivity is less than on the cooler north slopes.

Soils on bottom lands and terraces generally are level to gently sloping, or they have very short, steep slopes. They are treated as cool sites. Although slopes of less than 12 percent generally are not considered significant, soils in groups 1 and 2 having a slope of less than 12 percent may be on ridgetops or on foot slopes, and location may be a site factor.

SITE INDEX. Site index is the average height, in feet, of the dominant and codominant free-growing trees of a given species at a given age. For oak, height at age 50 years is used (*23*); for cottonwood, height at age 30 years is used (*8*); and for loblolly pine, height at age 25 years is used (*10*). The site indexes listed here were determined by foresters of the Illinois Division of Forestry, the U.S. Forest Service, the University of Illinois, and the Soil Conservation Service, working with soil scientists of the Soil Conservation Service, who classified the soils. The data on which the indexes are based include measurements taken from nearby counties as well as measurements taken in Pulaski and Alexander Counties. For the most part, site index was determined for soil types that occur in these counties, but a few are for soils that resemble, but are not the same as, the soils in these counties.

AVERAGE ANNUAL GROWTH PER ACRE. Average annual growth per acre is given in board feet, measured by the International Rule. The figures are for well-stocked, well-managed stands and are calculated to age 30 for cottonwood and to age 60 for other hardwoods. They are taken from data obtained by the Soil Conservation Service and from data in USDA Technical Bulletin 560 (*23*) and USDA Agriculture Handbook 181 (*22*). Where site measurements were lacking, an estimate was made on the basis of data obtained by the Illinois Technical Forestry Association (*15*).

LIMITATIONS AND HAZARDS. Certain factors that affect the production of timber are related to the soil. Four such factors considered in Pulaski and Alexander Counties are seedling mortality, plant competition, equipment limitation, and erosion hazard. These factors are rated as to whether the limitation or hazard is slight, moderate, or severe. They are explained in the following paragraphs.

Seedling mortality refers to the expected loss of natural or planted tree seedlings as a result of soil characteristics or topographic features, not as result of plant competition.

TABLE 3.—*Suitability*

[Terms used in this table are defined under

Woodland group and mapping unit symbols	Potential productivity		Limitations and hazards
	Site index	Average annual growth per acre	
		Board feet	
Group 1: Gently sloping to strongly sloping, slowly permeable soils on uplands. (214B, 214C, 214C2, 214C3, 214D2, 214D3, 214E2, 214E3).	Cool sites: upland oak 80, loblolly pine 50–53. [1] Hot sites: upland oak 60–70; loblolly pine 47–50. [1]	Cool sites: upland oak 200–300. Hot sites: upland oak 120–200.	Seedling mortality, slight. Plant competition, moderate. Equipment limitation, slight. Erosion hazard, slight.
Group 2: Gently sloping to strongly sloping, moderately permeable soils on uplands. (75D, 216E, 308B, 308C, 308C2, 308D, 308D2, 308D3, 308E2, 308E3, 453C, 453D2, 453D3, 453E2, 453E3).	Cool sites: upland oak 71; loblolly pine 55; [1] tulip-poplar 89. Hot sites: upland oak 54–68; loblolly pine 50. [1]	Cool sites: upland oak 240–350; tulip-poplar and sweetgum 330–440. Hot sites: upland oak 80–180.	Seedling mortality, slight. Plant competition, severe. Erosion hazard, slight. Equipment limitation, slight.
Group 3: Steep and very steep, moderately permeable and slowly permeable soils on uplands. (214F2, 214F3, 216F, 216F3, 216G, 308F, 308F2, 308F3, 453F3).	Cool sites: upland oak 65–83; ash 89–95. Hot sites: upland oak 56–68; ash 49–69.	Cool sites: upland oak 150–320. Hot sites: upland oak 100–180.	Seedling mortality, moderate. Plant competition, moderate. Erosion hazard, severe. Equipment limitation, moderate to severe.
Group 4: Steep and very steep, mostly cherty, moderately permeable and moderately rapidly permeable soils. (471G, 990F, 990G).	Cool sites: upland oak 57–71. Hot sites: upland oak 50–58.	Cool sites: upland oak 100–200. Hot sites: upland oak 70–110.	Seedling mortality, severe. Plant competition, slight to moderate. Erosion hazard, severe. Equipment limitation, severe.
Group 5: Level to strongly sloping, moderately permeable to slowly permeable soils on terraces. (344, 462A, 462B, 462C2, 462C3, 462D2, 462D3, 463A, 463B, 463C2, 463E3, 467C3).	Upland oak 77–93; loblolly pine 51–55.	Upland oak 260–430.	Seedling mortality, slight. Plant competition, severe. Erosion hazard, slight to severe. Equipment limitation, slight.
Group 6: Level to sloping, somewhat poorly drained, slowly permeable to very slowly permeable soils on uplands and terraces. (164A, 164B, 219, 338A, 338B, 461A, 461B).	Upland oak 58–74; sweetgum 86; loblolly pine 45.[1]	Upland oak 110–230; sweetgum 400.	Seedling mortality, slight. Plant competition, moderate. Equipment limitation, slight. Erosion hazard, slight.
Group 7: Level, poorly drained, slowly permeable and very slowly permeable soils on terraces and uplands. (84, 109, 165, 178, 401, 460).	Upland oak 57–85; loblolly pine 32–37.	Upland oak 100–350.	Seedling mortality, slight. Plant competition, moderate. Erosion hazard, slight. Equipment limitation, severe.

See footnotes at end of table.

of soils for woodland

the heading "Soil-Woodland Interpretations"]

Preference ratings for adapted species in existing stands			Planting guide	
Most desirable	Acceptable	Least desirable	Uneroded to moderately eroded sites	Severely eroded sites
Cool sites: white oak, black walnut, black oak, northern red oak. Hot sites: northern red oak, scarlet oak, white oak, black oak.	Cool sites: scarlet oak. Hot sites: white ash.	Cool sites: hickory, maple, blackgum, persimmon, sassafras. Hot sites: hickory, maple, blackgum, persimmon, sassafras.	Cool sites: loblolly pine, shortleaf pine, white pine, white oak, Scotch pine,[2] white ash, tulip-poplar. Hot sites: loblolly pine, shortleaf pine, white oak, Scotch pine.[2]	Cool sites: loblolly pine, shortleaf pine, Scotch pine,[2] black locust.[3] Hot sites: loblolly pine, shortleaf pine, Scotch pine,[2] black locust.[3]
Cool sites: tulip-poplar, white oak, white ash, sweetgum, northern red oak, black oak, black walnut. Hot sites: northern red oak, scarlet oak, black oak, white oak.	Cool sites: soft maple, scarlet oak. Hot sites: soft maple, tulip-poplar, white ash.	Cool sites: hickory, blackgum, sassafras, beech, hard maple. Hot sites: hickory, blackgum, sassafras, beech, hard maple.	Cool sites: loblolly pine, shortleaf pine, white pine black walnut, white oak, white ash, Scotch pine,[2] tulip-poplar. Hot sites: loblolly pine, shortleaf pine, white oak, Scotch pine.[2]	Cool sites: loblolly pine, shortleaf pine, white pine, Scotch pine,[2] black locust.[3] Hot sites: loblolly pine, shortleaf pine, Scotch pine,[2] black locust.[3]
Cool sites: tulip-poplar, white oak, black walnut, northern red oak, black oak, white ash, sweetgum. Hot sites: northern red oak, black oak, scarlet oak, white oak.	Cool sites: scarlet oak. Hot sites: tulip-poplar, black walnut, white ash.	Cool sites: hickory, beech, blackgum, hard maple, sassafras. Hot sites: hickory, beech, blackgum, hard maple, sassafras.	Cool sites: loblolly pine, shortleaf pine, white pine, tulip-poplar, black walnut, white oak, white ash, Scotch pine.[2] Hot sites: loblolly pine, shortleaf pine, white oak, Scotch pine.[2]	Cool sites: loblolly pine, shortleaf pine, Scotch pine,[2] black locust.[3] Hot sites: loblolly pine, shortleaf pine, Scotch pine,[2] black locust.[3]
Cool sites: white oak, northern red oak, black oak, tulip-poplar. Hot sites: black oak, northern red oak, scarlet oak, white oak.	Cool sites: scarlet oak, redcedar. Hot sites: redcedar, post oak.	Cool sites: hickory, post oak, blackjack oak, hard maple, beech. Hot sites: hickory, post oak, blackjack oak, hard maple, sassafras.	Cool sites: loblolly pine, shortleaf pine, white pine, redcedar, Scotch pine.[2] Hot sites: loblolly pine, shortleaf pine, redcedar, Scotch pine.[2]	([4]).
Tulip-poplar, black walnut, white oak, northern red oak, sweetgum, white ash, Shumard oak, cherrybark oak, soft maple, sycamore.	Bur oak.	Hickory, beech, blackgum, sassafras.	Cottonwood, black walnut, sweetgum, tulip-poplar, white oak, northern red oak, sycamore, white ash, loblolly pine, shortleaf pine, white pine, Scotch pine.[2]	Loblolly pine, shortleaf pine, white pine, Scotch pine.[2]
White oak, northern red oak, white ash, sweetgum, black oak, cherrybark oak.	Black walnut, tulip-poplar.	Hickory, soft maple.	Loblolly pine, shortleaf pine, white pine, white oak, northern red oak, white ash, sycamore, Scotch pine,[2] tulip-poplar.	Loblolly pine, shortleaf pine, white pine, Scotch pine.[2]
Black oak, white oak, pin oak, northern red oak, white ash, swamp white oak, bur oak, cherrybark oak.	Post oak.	Hickory, blackjack oak.	Pin oak, sycamore, sweetgum, loblolly pine, cottonwood.	([4]).

TABLE 3.—*Suitability*

Woodland group and mapping unit symbols	Potential productivity		Limitations and hazards
	Site index	Average annual growth per acre	
		Board feet	
Group 8: Nearly level to moderately sloping, dominantly well drained, moderately permeable to rapidly permeable sandy soils on terraces. (53B, 131A, 131B, 131C, 131C2, 131D2, V131, 175A, 175B, 175C, 184A, 184B, 266).	Upland oak 51–71; sweetgum 74–76; black walnut 48–68; loblolly pine 47.[1]	Upland oak 70–200; sweetgum 250–300; black walnut 44–155.[5]	Seedling mortality, slight to moderate. Plant competition, moderate. Erosion hazard, slight. Equipment limitation, slight.
Group 9: Level and sloping, somewhat poorly drained to well-drained, moderately permeable and moderately slowly permeable, light-colored silt loams on bottom lands. (72, 180, 331, 333, 382, 475).	Bottom-land soft hardwoods [6] 79–105.	Bottom-land soft hardwoods [6] 280–600.	Seedling mortality, slight. Plant competition, severe. Erosion hazard, slight. Equipment limitation, slight to moderate.
Group 10: Level, poorly drained, slowly permeable silt loams on bottom lands. (108, 334).	Bottom-land hard hardwoods [7] 82–92.	Bottom-land hard hardwoods [7] 310–520.	Seedling mortality, slight. Plant competition, moderate. Erosion hazard, slight. Equipment limitation, severe.
Group 11: Level, poorly drained and very poorly drained silty clay loams and silty clays on bottom lands. (70, 70+, 71A, 71C, 85, 288, 420, 422, 422+, 426, 525, 590A, 590B).	Bottom-land hard hardwoods [7] 79–91.	Bottom-land hard hardwoods [7] 280–450.	Seedling mortality, slight. Plant competition, severe. Erosion hazard, slight. Equipment limitation, severe.
Group 12: Level soils that are frequently overflowed, are ponded, or have a high water table; on bottom lands. (W71, W108, 108+, W288, W420, W422, W426, W590).	Bottom-land hard hardwoods [7] 73–87.	Bottom-land hard hardwoods [7] 220–420.	Seedling mortality, severe. Plant competition, moderate to slight. Erosion hazard, slight. Equipment limitation, severe.
Group 13: Level and sloping, moderately dark colored sandy, silty, and clayey soils on bottom lands. (92, 161, 162A, 162B, 284A, 284B, 284+, 304A, 304B, 306, 452A, 452B, 452C, 455, 456A, 456B, 589A, 589B).	Bottom-land soft hardwoods [6] 78–102.	Bottom-land soft hardwoods [6] 270–570.	Seedling mortality, slight. Plant competition, severe. Erosion hazard slight. Equipment limitation, slight to moderate.

[1] Estimated for loblolly pine.
[2] For Christmas trees only.
[3] For use in active gullies.
[4] Not severely eroded.

It is assumed that the natural seed supply is adequate, the stock is good, planted seedlings are properly cared for, climatic conditions are normal, and there are adequate openings in the canopy of the natural stand.

A rating of *slight* indicates an expected seedling mortality of up to 25 percent. Ordinarily, natural regeneration will take place. For planted seedlings, satisfactory stocking will be obtained from the initial planting. Starting cottonwood and sycamore on bottom lands, however, may be difficult unless naturally occurring species are suppressed. Sycamore should be preferred over cottonwood for planting on the soils of woodland groups 9, 10, and 11.

A rating of *moderate* indicates an expected seedling mortality of 25 to 50 percent, mainly because of severe erosion, droughtiness, or hot exposure. Natural revegetation will not always supply adequate and immediate stocking. For planted seedlings, some replanting may be needed to fill open spaces.

A rating of *severe* indicates an expected seedling mortality of more than 50 percent, mainly because the soils are shallow, stony, steep, or extremely wet. Natural regeneration cannot be relied on for stands of desirable trees. For planted seedlings, special planting techniques and considerable replanting may be required. For the Stookey-Bodine complexes in woodland group 4, seedling mortality is lower on the silty upper part of slopes than it is on the shallow cherty lower part. Also, seedling mortality is less on cool sites than on hot sites.

Plant competition refers to the rate at which unwanted trees, shrubs, and weeds are likely to invade a given site when openings are made in the canopy. The presence of well-stocked stands of desirable seedlings is assumed.

of soils for woodland—Continued

Preference ratings for adapted species in existing stands			Planting guide	
Most desirable	Acceptable	Least desirable	Uneroded to moderately eroded sites	Severely eroded sites
White oak, northern red oak, white ash, sweetgum, black oak.	Black walnut, tulip-poplar.	Hickory, soft maple.	Loblolly pine, shortleaf pine, white pine, white oak, northern red oak, white ash, sycamore, Scotch pine. [2]	([4]).
Cottonwood, sycamore, tulip-poplar, Shumard oak, cherrybark oak, sweetgum, green ash, soft maple.	Pin oak, cypress.	Red elm, white elm, hickory, blackgum.	Sycamore, tulip-poplar, black walnut, sweetgum, cottonwood, soft maple.	([4]).
Pin oak, cherrybark oak, swamp white oak, bur oak, sweetgum, green ash.	Cypress, soft maple, hackberry, sycamore.	Hickory, honeylocust, willow.	Sycamore, pin oak, sweetgum.	([4]).
Pin oak, cherrybark oak, swamp white oak, bur oak, sweetgum, green ash.	Cypress, pecan, soft maple, cottonwood.	Hickory, honeylocust, hackberry, willow.	Sycamore, soft maple, sweetgum, cottonwood.	([4]).
Cypress, tupelo-gum, swamp white oak, swamp chestnut oak.	Pin oak, sweetgum, green ash, soft maple.	Willow, birch, hickory.	Cypress.	([4]).
Cottonwood, sycamore, sweetgum, cherrybark oak, Shumard oak, soft maple, green ash.	Pin oak, pecan.	Red elm, white elm, hickory, blackgum.	Cottonwood, sycamore.	([4]).

[5] Data from Black Walnut Workshop Proceedings, August 2–3, 1966, page 52, table 2. For trees at 10-foot spacing, Scribner rule for 10 inches d.b.h. and larger, based on a 75-year rotation.
[6] Includes cottonwood, willow, sycamore, soft maple, sweetgum, green ash, and others.
[7] Dominantly pin oak and hickory but includes all oaks, green ash, soft maple, and sweetgum.

A rating of *slight* indicates that competition from other plants is no special problem. The soils are such that invasion by undesirable species will not impede growth of desirable species.

A rating of *moderate* indicates that plant competition develops but generally does not prevent an adequate stand from becoming established. Establishment may be delayed, however, and initial growth slowed. Simple management techniques can be used to minimize the problem. Hickory, willow, sassafras, persimmon, and other undesirable trees can be eliminated so that more desirable species can develop.

A rating of *severe* indicates that plant competition prevents desirable trees from restocking naturally. Where competition is severe, special management and careful preparation of the site are necessary. Such treatment includes controlled burning, use of chemical sprays, and girdling.

Equipment limitation depends on soil characteristics and topographic features that restrict the use of equipment in planting, tending, or harvesting trees.

A rating of *slight* indicates that there is little or no restriction on the type of equipment or on the time of year that it can be used.

A rating of *moderate* indicates that the use of equipment is restricted because slopes are steep, or because the soils are wet for periods of up to 3 months. Late in winter or during periods of abnormally heavy rainfall, heavy equipment cannot be used on soils in woodland groups 9 and 13 without causing damage to tree roots and to soil structure.

A rating of *severe* indicates that the use of equipment is restricted because of very steep slopes that require special

harvesting methods, or because, for more than 3 months during the year the soils are too wet for the use of equipment. On the very steeply sloping soils of woodland group 4, track-type equipment is needed for general use, and wheel-type tractors and trucks ought to be used only on well-constructed roads. Wide-track equipment generally is needed on the very wet soils of group 12. In groups 7, 10, and 11, the use of equipment when the soils are wet causes serious damage both to tree roots and to soil structure.

Erosion hazard refers to the potential risk of erosion if the site is managed according to acceptable standards for woodland use. Factors that influence these risks are the length and steepness of the slopes and the water-holding capacity of the soil. The hazard of erosion is increased if the watershed above the wooded site is cultivated.

A rating of *slight* indicates that control of erosion is not a special problem and that soil loss on roads, logging trails, and fire lanes can be controlled by normal construction and maintenance methods. Harvesting is not restricted by the need for special erosion control practices, but normal care needs to be used on slopes to prevent the formation of gullies. Normal care needs to be taken in the preparation of seedbeds, particularly on slopes of more than 7 percent.

A rating of *moderate* indicates that some care is needed to control erosion during harvesting operations. Heavy traffic over extended periods may result in severe erosion of roads and trails unless special construction and maintenance measures are used.

A rating of *severe* indicates that intensive treatment, special equipment, and special methods of operation must be used to minimize soil loss. Soils rated severe generally have steep slopes, rapid runoff, and low cohesive qualities. Harvesting operations ought to be conducted across the slope, and care needs to be taken in locating roads, skid trails, and fire lanes to avoid the concentration of water and the formation of gullies.

Preference ratings for adapted species in existing stands. Trees listed as *most desirable* are those that have high market value and that grow well on the specified site. They should be protected and favored in existing stands. Trees listed as *acceptable* are less well suited to the site or have lower market value, but they should be allowed to mature if they are growing in existing stands. Some trees listed as acceptable on one site may be rated most desirable on other sites. Trees listed as *least desirable* have low market value or undesirable growth habits. They should be discouraged or removed to allow for the growth of desirable trees.

Planting guide. Trees are listed in order of their suitability for planting, both in areas that are not severely eroded and in areas that are severely eroded, and on hot sites and cool sites.

Pine generally is better suited to severely eroded soils than hardwoods. Loblolly pine and shortleaf pine are suitable for planting in such areas, although Pulaski and Alexander Counties are at or beyond the northern limit of their natural range. After about 25 years, these stands can be harvested for pulpwood. By then native hardwoods will have had an opportunity to regenerate and may be allowed to take over the stand. If it is desirable to keep the areas in pine, selective cutting can be practiced.

Black locust is suitable for planting in severely gullied areas. It is grown mainly as a soil builder and as a nurse tree for more desirable hardwoods that are interplanted with it (*14*). The locust borer is likely to cause severe damage, and few sound trees reach usable age.

Pine plantations

Many acres in southern Illinois are no longer suitable for growing crops and ought to be reforested. Reforestation by planting has put many of these acres back into production. Pine has been used, because hardwoods generally cannot be successfully established on poor sites. Both shortleaf pine and loblolly pine seem to be well suited, although the area is beyond the northern limit of their natural range. Growth and yield data from plantations of these species are encouraging. Yields can be estimated from a knowledge of soil characteristics (*10, 11*).

A thinning study (*5*) made of a plantation established in 1937 gives some examples of yields that can be expected from shortleaf pine. The plantation was on a slightly eroded Grantsburg silt loam, a soil not mapped in Pulaski and Alexander Counties but similar to the Hosmer soils of woodland group 1. The total yield for both thinned and unthinned stands was about 2,775 cubic feet, or 31 cords per acre. This represented an average annual growth during the period from 1950 to 1958 of about 2.5 cords per acre, or an annual growth of about 1.5 cords per acre for the entire life of the plantation. A later study, made when the plantation was 26 years old, showed that the unthinned portions of the stand had produced 4,200 cubic feet of rough wood per acre. On other plots, 20 cords of material for pulpwood had been cut and at least that volume was left for future growth and harvest.

A similar study was made of a plantation of shortleaf pine on Muren silt loam and Stookey silt loam, which are in woodland group 2. This plantation produced up to 3,869 cubic feet per acre at 20 years of age (*7*). During a 5-year period, between ages 15 and 20 years, these stands grew at the rate of 281 cubic feet, or slightly better than 3 cords per acre each year. In contrast, growth on a severely eroded Hosmer soil of woodland group 1 during the same 5-year period was about a third of that on the Muren and Stookey soils. Even on the poorer site, however, yields are favorable from the standpoint of pulpwood production. Most of the data available are for shortleaf pine, although the growth of loblolly pine generally exceeds that of shortleaf on most sites in southern Illinois (*6*).

Pine plantations in this two-county area are subject to a number of hazards. Loblolly pine is particularly likely to be damaged by ice storms, such as those that occurred in 1950 and 1952. This risk is fairly common throughout the range of loblolly pine. Shortleaf pine is extremely susceptible to attack by the pine tip moth. Such attacks seldom kill trees, but they retard growth and cause stem deformities. In particularly bad years, some trees make no net growth in height because terminal shoots are continually killed back. There are indications that *Fomes annosus*, a root-rotting fungus that spreads into the roots of living trees through fresh stumps, is becoming a serious menace in the management of pine plantations.

Use of the Soils for Wildlife [6]

Wildlife is abundant in Pulaski and Alexander Counties. Both species and types of habitat vary considerably. There are hilly forests, rolling pastures, level cropland, and swampy bayous. Common in the area are deer, squirrels, rabbits, quail, wild turkeys, songbirds, geese, and ducks. Fox, raccoons, groundhogs, hawks, and doves thrive in the same habitat.

The use of the soils for wildlife habitat does not necessarily mean that definite areas must be set aside for this purpose. Wildlife is a secondary crop on land used for growing grain, hay, pasture, or forest (fig. 16). It is a primary crop only on land especially set aside for wildlife.

Figure 16.—**Five-year old redcedars on Hosmer soils. This stand provides good cover for the soils and shelter for wildlife.**

Rating the soils for wildlife habitats

The soils of Pulaski and Alexander Counties have been placed in 12 groups according to their suitability for wildlife habitats. The estimated degree and kind of limitation of these groups for wildlife use are shown in table 4. The ratings provided in table 4 will aid in the selection of sites for habitat management. They also indicate the extent or degree of suitability of the soils for different classes of wildlife.

Factors not considered in the ratings are present land use and existing vegetation; size, shape, and location of the mapped areas; and the ability of wildlife to move from place to place.

A rating of *slight* indicates that habitats generally are easily created, improved, or maintained. There are few or no limitations that affect habitat management, and satisfactory results are well assured.

A rating of *moderate* indicates that habitats generally can be created, improved, or maintained, but there are moderate soil limitations that affect habitat management. Moderately intense management and fairly frequent attention are required to assure satisfactory results.

A rating of *severe* indicates that habitats generally can be created, improved, or maintained on these soils, but soil limitations are rather severe. Habitat management is difficult and expensive or requires intensive effort. Results are questionable.

A rating of *very severe* indicates that habitats cannot be created, improved, or maintained, or it is not practical to do so under prevailing soil conditions. Unsatisfactory results are probable.

ELEMENTS OF WILDLIFE HABITATS. Most managed wildlife habitats are created, improved, or maintained by (1) planting suitable vegetation; (2) manipulating existing vegetation; (3) inducing natural establishment of desired plants; or (4) combinations of such measures (*29*). The soil properties considered in determining limitations with respect to plant growth or water management include (1) effective depth to bedrock or gravel; (2) surface texture; (3) available moisture capacity to a depth of 30 inches; (4) natural soil drainage; (5) surface stoniness; (6) hazard of flooding; and (7) percent of slope. The eight wildlife habitats selected for ratings are discussed in the following paragraphs.

Grain and seed crops. Agricultural grain or seed-producing annuals planted to produce food for wildlife. These include corn, soybeans, wheat, oats, millet, buckwheat, cowpeas, sorghum, and sunflower.

Grasses and legumes. Domestic perennial grasses and herbaceous legumes established by planting to provide wildlife cover as well as food. These include fescue, brome, timothy, redtop, orchardgrass, reed canarygrass, clover, trefoil, alfalfa, and sericea lespedeza.

Wild herbaceous upland plants. Native or introduced perennial grasses and weeds that provide food and cover, principally to upland forms of wildlife, and that are established mainly through natural processes. Examples are pokeweed, beggarweed, goldenrod, dandelion, lespedeza, partridgepeas, wild beans, nightshade, and oatgrasses.

Hardwood woodland plants. Nonconiferous trees, shrubs, and woody vines that produce fruits, nuts, buds, catkins, twigs, or foliage used extensively as food by wildlife, and which are commonly established through natural processes but also may be planted. These include oak, beech, cherry, dogwood, persimmon, viburnum, maple, birch, poplar, grapes, honeysuckle, briers, and roses.

Coniferous woodland plants. Cone-bearing trees and shrubs that are important to wildlife primarily as cover but also furnish food in the form of browse, seeds, or fruit-like cones. Examples are pine, redcedar, juniper, cypress, and yew.

Wetland food and cover plants. Annual and perennial wild herbaceous plants in moist to wet sites, exclusive of floating or submerged aquatics. These plants produce food or cover used mainly by wetland forms of wildlife. Examples are smartweed, wild millet, rushes, sedges, reeds, switchgrass, and cattails.

Shallow water developments. Impoundments or excavations for control of water generally not exceeding 5 feet in depth. Examples are low dikes and levees; shallow dugouts, such as borrow pits along highways and levees; level ditches; and devices for water-level control in marshy streams or channels.

[6] WILLIAM J. MELVEN, biologist, Soil Conservation Service, assisted in the preparation of this section.

TABLE 4.—*Estimated degree and kind of limitations*

[The ratings slight, moderate, severe, and very severe are defined

Wildlife groups	Limitations for specified elements of wildlife habitats				
	Grain and seed crops	Grasses and legumes	Wild herbaceous upland plants	Hardwood woodland plants	Coniferous woodland plants
Group 1: Level, well-drained to somewhat poorly drained silt loams, fine sandy loams, and silty clay loams.	Slight	Slight	Slight	Slight	Severe; rapid growth.
Group 2: Gently sloping to strongly sloping, well drained and moderately well drained silt loams and fine sandy loams.	Moderate; hazard of erosion.	Slight	Slight	Slight	Severe; rapid growth.
Group 3: Strongly sloping to steep, well drained and moderately well drained silt loams and severely eroded soils.	Severe; steep slopes.	Moderate; steep slopes.	Slight	Slight	Severe; moderate to rapid growth.
Group 4: Very steep, well-drained silt loams.	Severe; very steep slopes.	Severe; very steep slopes.	Slight	Slight	Moderate; rapid growth of some trees.
Group 5: Very steep, well-drained, cherty and silty soils.	Severe; very steep slopes; low available moisture capacity in some places.	Severe; very steep slopes; low available moisture capacity in some places.	Moderate; low available moisture capacity in some places.	Moderate; shallow soil; low available moisture capacity in some places.	Slight to moderate; moderately rapid growth in some places.
Group 6: Level, somewhat poorly drained silt loams and fine sandy loams.	Moderate; wetness.	Moderate; wetness.	Slight	Slight	Severe; rapid growth.
Group 7: Gently sloping, somewhat poorly drained silt loams and fine sandy loams.	Moderate; hazard of erosion; wetness.	Moderate; wetness.	Slight	Slight	Severe; rapid growth.
Group 8: Level to sloping, well-drained to excessively drained fine sandy loams.	Moderate; low available moisture capacity.	Moderate; low available moisture capacity.	Moderate; low available moisture capacity.	Slight to moderate.	Slight to moderate; moderately rapid growth in some places.
Group 9: Level to gently sloping, somewhat poorly drained to poorly drained silty clays underlain by sand.	Moderate; problems of tilth, seeding, and erosion.	Moderate; problems of tilth, seeding, and erosion.	Moderate; clayey soil limits seeding.	Slight	Moderate; moderately rapid growth.
Group 10: Level, poorly drained silt loams, fine sandy loams, and silty clay loams.	Moderate; wetness.	Moderate; wetness.	Moderate; wetness.	Slight	Slight to severe; affected by artificial drainage; generally severe except for cypress.
Group 11: Level, poorly drained to very poorly drained silty clay loams and silty clays.	Moderate to severe; wetness and tilth.	Moderate; wetness and tilth.	Moderate; wetness and tilth.	Slight	Moderate to severe; generally severe seedling mortality except for cypress.
Group 12: Very wet or frequently flooded soils in level areas or depressions.	Severe; wetness and flooding.	Severe; wetness and flooding.	Severe; wetness and flooding.	Moderate to severe, depending on duration of ponding.	Severe; severe seedling mortality; cypress generally only suitable conifer.

[1] Based on adaptability of hardwood woodland plants only. Coniferous woodland plants are not important enough to affect the evaluation of this group of soils.

affecting use of soils as wildlife habitats

under the heading "Rating the Soils for Wildlife Habitats"]

Limitations for specified elements of wildlife habitats—Continued			Limitations for classes of wildlife		
Wetland food and cover plants	Shallow water developments	Excavated ponds	Openland	Woodland	Wetland
Severe; too well drained.	Severe; too well drained.	Severe; limited water supply.	Slight	Slight	Severe; limited water retention.
Severe; too well drained.	Severe; sloping and too well drained.	Severe; slope and limited water supply.	Slight	Slight	Severe; limited water retention.
Severe; too well drained.	Severe; steep and too well drained.	Severe; steep slopes and limited water supply.	Moderate; slope limits use for seeded food patches.	Slight	Severe; limited water retention.
Very severe; very steep and too well drained.	Very severe; very steep and too well drained.	Severe; very steep slopes and limited water supply.	Moderate; slope limits use for seeded food patches.	Moderate	Very severe; limited water retention.
Very severe; very steep and too well drained.	Very severe; very steep and too well drained.	Severe; very steep slopes and limited water supply.	Severe: slope and depth limits use for food patches.	Moderate; slope and depth limits its use for food and cover growth.	Very severe; limited water retention.
Moderate; limited water retention.	Moderate; limited water retention.	Moderate; limited water retention.	Slight	Slight	Moderate; limited water retention.
Severe; limited water retention.	Severe; sloping; limited water retention.	Severe; sloping	Slight	Slight	Severe; limited water retention.
Very severe; excessively drained.	Very severe; excessively drained.	Very severe; lack of water retention.	Moderate; low available moisture capacity; moderate to low yields of food crops.	Slight to moderate; unfavorable tree growth in some places.	Very severe; droughty soil.
Slight to severe; some areas moderately well drained.	Moderate; limited depth to sand.	Severe; sandy substrata.	Moderate; problems of tilth, seeding, and erosion.	Slight	Moderate to severe; sandy substrata.
Slight	Slight	Slight	Moderate; wetness limits food production.	Slight [1]	Slight.
Slight	Slight	Slight	Moderate; wetness and tilth limit production.	Slight [1]	Slight.
Slight	Slight to moderate; subject to flooding.	Slight to severe; subject to flooding.	Severe; wetness and flooding limit food production.	Moderate to severe; [1] wetness limits number and kind of trees.	Slight to moderate; subject to flooding.

Excavated ponds. Dug-out water areas or combination dug-out and dammed areas that have water of suitable quality and depth and in ample supply for the production of fish or wildlife. Hillside or embankment-type ponds may be suitable in some places but are not rated because they generally are constructed on sites not typical of the soil mapping unit and are influenced by other site factors.

Classes of wildlife. As shown in table 4, there are three main classes of wildlife. These classes are defined as follows:

Openland wildlife. Birds and mammals that normally make their homes on cropland, pastures, lawns, and areas overgrown with grasses, herbs, and shrubby plants. Examples of this kind of wildlife are quail, meadowlarks, field sparrows, red-winged blackbirds, cottontail rabbits, red foxes, and woodchucks.

Woodland wildlife. Birds and mammals that normally make their homes in areas wooded with hardwood trees and shrubs, coniferous trees and shrubs, or mixtures of such plants. Examples are thrushes, vireos, scarlet tanagers, doves, turkeys, squirrels, gray foxes, deer, and raccoons.

Wetland wildlife. Birds and mammals that normally make their homes in wet areas such as ponds, marshes, and swamps (fig. 17). Examples are ducks, geese, herons, mink, muskrats, and raccoons.

***Figure 17.*—Cypress and tupelo-gum trees growing in shallow water on west side of Horseshoe Lake.**

Wildlife suitability groups

This subsection describes the 12 wildlife suitability groups in the two-county area and gives relevant information for each. All of the soils in one group are estimated to have similar capacity to produce food and cover for wildlife. To find what group a specific soil is in, refer to the "Guide to Mapping Units" at the back of this survey.

In addition to the information given here, information that can be related to the use of the soils for wildlife habitats can be found in other sections of this survey. For example, the management suggested for cropland and pasture in the subsection "Management by Groups of Soils" also applies to planted patches of food and cover for wildlife. The section "Use of the Soils for Woodland" contains a table that lists the trees suited to the various soils. It is well to keep in mind, however, that trees undesirable for commercial timber are not necessarily undesirable for wildlife habitats. The section "Use of the Soils for Engineering" contains information on water control and pond construction that can be useful in creating desirable wildlife habitats.

WILDLIFE GROUP 1

This group consists mainly of deep, level or nearly level soils of the Allison, Alvin, Elsah, Gorham, Harvard, Haymond, Millbrook, Newart, Riley, Sciotoville, Sharon, Tice, Ware, and Wheeling series. These soils are well drained to somewhat poorly drained and have high available moisture capacity. Those soils on bottom lands that are not protected by levees are subject to annual spring overflow of the Mississippi and Ohio Rivers. Flash floods are a hazard in some areas of the Elsah, Haymond, and Sharon soils. Some gently sloping and sloping Gorham, Riley, Tice, and Ware soils were included.

The soils of this group provide good food and cover for openland wildlife, although in some areas winter grain and hay may be extensively damaged by flooding.

These soils have few limitations for woodland wildlife, but coniferous plants grow too rapidly to produce a desirable type of habitat.

Under special management, the somewhat poorly drained Gorham, Millbrook, Newart, and Tice soils will produce food and cover that wetland wildlife can use. Most of the soils of this group, however, are too well drained to provide suitable habitats for wetland wildlife, and they are not desirable sites for excavated ponds or for shallow water developments. In many places the soils are underlain by thin to thick layers of sand and thus are not suitable for water impoundments.

WILDLIFE GROUP 2

This group consists of gently sloping to strongly sloping soils of the Alford, Alvin, Drury, Hosmer, Muren, Sciotoville, and Wheeling series. These soils are on uplands and terraces. They have a silt loam or a fine sandy loam surface layer, are well drained or moderately well drained, and have high to moderate available moisture capacity. All except the Hosmer soils have a deep root zone. The Hosmer soils are somewhat limited in internal drainage and in available moisture capacity by a fragipan that occurs at a depth of 20 to 36 inches.

These soils have moderate limitations for grain and seed crops because of the hazard of erosion. Contouring and rotation of food and cover patches are needed to help control erosion. Fertilization is advisable. Erosion control and

fertilization are especially needed on the strongly sloping, severely eroded soils.

Hardwoods grow well on these soils, and patches of good food and cover develop naturally on idle land. They may be improved by selective planting and weeding. Coniferous plantings grow too rapidly to produce the low shrubby type of habitat most desirable for woodland wildlife.

Both slope and natural drainage preclude the use of these soils for wetland wildlife. Many sites, however, are suitable for hillside or embankment ponds, which will provide water for wildlife and opportunities for local fishing.

WILDLIFE GROUP 3

This group consists of dominantly steep, moderately well drained and well drained silt loams of the Alford, Hosmer, Muren, Stookey, and Wheeling series. These soils have high to moderate available moisture capacity. Many have lost part or all of their original silt loam surface layer through erosion. All except the Hosmer soils are deep. At a depth of 18 to 30 inches in the Hosmer soils is a fragipan that somewhat restricts internal drainage and available moisture capacity. Two sloping to strongly sloping, severely eroded soils of the Hosmer and Markland series are included in this group. These severely eroded soils have medium to low available moisture capacity and are low in fertility.

These soils need to be kept in close-growing vegetation most of the time, because of the serious hazard of erosion. Slopes of less than 18 percent can be used for cultivated patches of grain and seed crops for 1 year in 4 years or less, whereas slopes of more than 18 percent should not be used for grain and seed crops. These areas can be used for grasses and legumes if erosion is controlled during seeding. Till all food patches on the contour.

Hardwoods grow readily on these soils, and good food and cover patches develop naturally. Selective planting and weeding is beneficial. Coniferous plantings are likely to grow too rapidly to produce the low shrubby type of habitat most desirable for wildlife.

Because of the steep slopes and natural drainage, these soils are not suitable for wetland wildlife, but there are many sites suitable for embankment or hillside ponds.

WILDLIFE GROUP 4

This group consists only of Stookey silt loam, 30 to 50 percent slopes. This deep, well-drained soil has high available moisture capacity and is productive, but it is limited in use by the steep slopes. In a few areas the soil is calcareous within 40 inches of the surface.

The use of this soil for patches of grain and seed or planted grasses and legumes is severely limited because the steep slopes restrict the use of machinery. Wild herbaceous plants grow in abundance, however, if the land is cleared or if openings are made in the forest cover. Otherwise, food patches are limited to hand-seeded areas.

Hardwoods grow readily on this soil, and desirable plants for food and cover develop naturally in cleared or severely cutover areas. Additional plantings can be made to improve some sites or to add variety. Coniferous plantings should be limited to redcedar and juniper; pine grows too rapidly to provide desirable cover.

Where the soil is calcareous, trees are sparse and small and are interspersed with grassy areas. These areas provide desirable wildlife habitats.

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Hillside pond sites are few, but with special care, small wildlife water ponds can be constructed. Large ponds generally are not feasible.

WILDLIFE GROUP 5

This group consists of very steep cherty soils of the Bodine series and of moderately steep to very steep, well-drained silt loams of the Stookey series. The Stookey soils, which are on the upper part of the slope, are deep and have high available moisture capacity. The cherty Bodine soils, which are on the lower 20 to 80 percent of the slope, are shallow and have low available moisture capacity.

The cherty soils have severe limitations if used for planted food patches. Wild herbaceous plants, however, commonly grow in open areas. These plants vary in quality but generally produce a moderate amount of food and cover.

Hardwood plants vary in growth on the cherty soils but generally provide moderately good habitats. The growth of conifers is likely to be retarded, and, therefore, conifer plantings provide good wildlife cover.

The deep silty soils on the upper part of slopes are more productive than the cherty soils. Planted food patches are limited because of the steep slopes, but wild herbaceous plants and hardwood shrubs and vines provide an abundance of good food and cover.

The soils of this group do not provide suitable food and cover for wetland wildlife.

WILDLIFE GROUP 6

In this group are deep, level, somewhat poorly drained soils of the Belknap, Dupo, Hurst, Roby, Stoy, Wakeland, and Weinbach series. These soils are on uplands, terraces, and bottom lands. They have a silt loam or fine sandy loam surface layer and have high or moderately high available moisture capacity. The Belknap, Dupo, and Wakeland soils, which are on bottom lands, are subject to flash floods or to overflow for short periods.

These soils have moderate limitations if used for seed and grain or for grasses and legumes. Although many kinds of plants are suitable, drainage by means of surface ditches generally is needed for best plant growth and for early seeding in spring. Wild herbaceous plants grow in areas left to develop naturally.

There are few limitations for woodland wildlife, but coniferous plantings grow too rapidly to provide desirable woodland habitats for more than a few years.

These soils have moderate limitations for wetland wildlife. Certain water-tolerant plants occur naturally, and others can be encouraged if natural drainage is impeded by dikes, levees, or other means. The silty Belknap and Wakeland soils do not hold water well enough for use as pond sites.

WILDLIFE GROUP 7

This group consists of deep, gently sloping, somewhat poorly drained soils of the Hurst, Roby, Stoy, and Weinbach series. These soils are on uplands and terraces. They have a silt loam or fine sandy loam surface layer and have moderately high available moisture capacity.

Control of erosion in planted or seeded sites is a moderate problem. Food patches need to be tilled on the contour. Patches used for grain or seed should be rotated annually with those used for grasses or legumes. Wild

herbaceous plants develop naturally on idle land, although reseeding may be a little slow in severely eroded areas.

There are few limitations for woodland wildlife. A good growth of plants for food and cover soon develops in idle areas, but additional plantings of some species may be desirable. Most coniferous plantings grow too rapidly to provide suitable habitats for more than a few years.

These soils are poorly suited to wetland wildlife, although a few water-tolerant food plants grow naturally on them. Because of the slope, they are not suitable as sites for shallow water areas or for excavated ponds. Some sites, however, can be used for impoundments.

WILDLIFE GROUP 8

This group consists of level to sloping fine sandy loams and loamy fine sands of the Bloomfield, Disco, Lamont, Landes, and Sarpy series. These soils occur on stream terraces and on bottom lands along the Mississippi River. The Disco, Landes, and Lamont soils are well drained, and the Bloomfield and Sarpy soils are excessively drained. The available moisture capacity is low to moderate.

These soils are of somewhat limited suitability for food patches because of low to moderate available moisture capacity. Although a wide variety of plants can be grown, yields are moderate to low, especially in dry years. Small annual applications of fertilizer are needed, since sandy soils do not retain plant nutrients well. To prevent wind erosion, a plant cover ought to be maintained at all times, except when seedbeds are being prepared. The Bloomfield and Sarpy soils are more droughty and more susceptible to wind erosion than the other soils in this group.

Woodland habitats can be developed on these soils, although the growth of hardwoods is slower on the droughty Bloomfield and Sarpy soils than on the other soils of the group. Some areas of the Sarpy soils are suited only to hardwoods tolerant of calcareous soils. Conifers grow slowly on all the soils and produce moderately favorable habitats.

These sandy soils are not suited to the development of wetland wildlife habitats.

WILDLIFE GROUP 9

This group consists of level to gently sloping silty clays of the Bowdre and Cairo series. These soils are underlain by sandy material. They occur on bottom lands along the Mississippi River and are somewhat poorly drained or poorly drained. They have moderate available moisture capacity.

These soils have moderate limitations for use as food patches. Level areas commonly require drainage for favorable production or for early seeding in spring. Sloping areas should be plowed across the slope. Continued erosion brings the less productive sandy material closer to the surface. These soils are difficult to work when they are either too wet or too dry. Thus, timely seeding of food patches may not be feasible. Fall plowing is desirable if patches are not needed for winter use.

Hardwoods grow well on these soils and provide desirable woodland habitats. Conifers generally grow too rapidly to provide desirable cover for more than a few years.

Level areas, particularly those of the Cairo soils, can be used to produce wetland food and cover plants. Because of the underlying sand, the soils of this group are not suitable sites for ponds, and the Bowdre soils are not suited to shallow water developments.

WILDLIFE GROUP 10

This group consists of level, poorly drained soils of the Beaucoup, Birds, Bonnie, Cape, Darwin, Ginat, Karnak, Okaw, Petrolia, Racoon, Ruark, and Weir series. These soils are on uplands, stream terraces, and bottom lands. They have a silt loam, silty clay loam, or fine sandy loam surface layer and have moderate to high available moisture capacity. Many areas on bottom lands are subject to flooding.

The soils in this group are of limited use for openland food patches because of poor drainage. They are wet in winter and remain wet until late in spring. Consequently, the planting of food patches generally is delayed. Surface ditches are needed to remove excess water. If plants are to stand over winter, those suited to wet conditions should be used. Those soils that have a silt loam surface layer generally become dry late in summer. As a result, crops lack moisture.

These soils provide good hardwood woodland habitats. Except for cypress, coniferous plantings do not grow well.

Wetland food and cover plants grow naturally, and most of these soils are suitable as sites for either shallow water developments or for excavated ponds. The Ruark soil is not suitable for impounded water developments.

WILDLIFE GROUP 11

This group consists of poorly drained and very poorly drained silty clays or silty clay loams of the Cape, Darwin, Jacob, Karnak, and Piopolis series. These soils are in level areas and depressions on bottom lands. They are deep and have moderate available moisture capacity. Most areas along the Cache River are subject to overflow, unleveed areas on bottom lands along the Mississippi River are subject to flooding, and some low areas or depressions on leveed bottom lands receive local runoff and are ponded for short periods.

Narrow sloping areas of the Darwin soils were included in this group because they have similar restrictions for use, except that they are not suited to shallow water developments and ponds.

Drainage is needed to make these soils suitable for food and cover patches for openland wildlife. Surface ditches must be used because tile does not function properly. Tilth is also a limitation. Seedbeds cannot be prepared when the soil is too wet or too dry. Thus, timely seeding of food patches may be difficult. Fall plowing is desirable if patches are not needed for winter use. Only water-tolerant plants are suitable. All of these soils except the Darwin are naturally acid and are low in fertility.

These soils provide good woodland habitats. Woodland food plants grow naturally in opened areas. Except for cypress, coniferous plantings do not grow well.

Wetland food plants occur naturally in abundance, and shallow water developments or excavated ponds are well suited. Ponds or shallow water developments, however, may be damaged if they are constructed in areas subject to severe overflow.

WILDLIFE GROUP 12

This group consists of Alluvial land and of very wet soils of the Bonnie, Cairo, Cape, Darwin, Karnak, Petrolia, and Piopolis series.

These soils are on bottom lands. They are ponded, are frequently flooded, or have a high water table for more than 6 months during the year. The surface layer ranges from silt loam to silty clay. If it is feasible to protect these soils from overflow or to drain them adequately, then they would have the same limitations as other soils in their respective series and would be placed in group 6, 9, 10, or 11.

These soils are not well suited to openland wildlife. Wetness and flooding limit their use for planted food patches.

Wetness is a moderate to severe limitation for hardwoods, depending on the duration of ponding. In well-stocked woodlands, the understory generally is clean and open, providing little cover for wildlife. Cleared areas provide an abundance of food and cover, unless they are ponded most of the year. Except for cypress, coniferous plantings do not grow well.

Most areas are suitable for wetland wildlife. Wetland food plants grow in abundance in cleared areas. Shallow water areas occur naturally, and more can be readily developed. Some areas are subject to overflow, and in these moving water may damage structures and ponds.

Alluvial land, which is adjacent to the Mississippi and Ohio Rivers, is flooded annually. In most areas of Alluvial land, the woodland has a dense undergrowth that provides good food and cover. These areas are natural habitats for wetland wildlife, but few manmade developments are practical because of the hazard of flooding.

Use of the Soils for Recreation [7]

There is an increasing demand throughout the country for land and facilities for outdoor recreational activities, including boating, swimming, picnicking, fishing, hiking, and camping. Much of the land in Pulaski and Alexander Counties is favorable for the development of recreation areas. The topographic resources include the broad bottom lands along the Mississippi River, the Cache River basin, the rolling to hilly uplands of Pulaski County, and the very hilly uplands of Alexander County. Much of the wet and hilly land is forested. In the hilly areas are bluffs, ridges, and observation points that offer panoramic views. The lakes, ponds, rivers, streams, and swamps provide a variety of recreational opportunities. The Shawnee National Forest occupies a considerable acreage in Alexander County.

Soils information is basic for the comprehensive planning and development of outdoor recreation areas. The soil properties that affect such use include soil depth, natural drainage or wetness, slope, permeability or percolation rate, texture, hazard of overflow, stoniness, and the ability of the soil to sustain a load. These qualities were considered in grouping the soils into 17 recreation groups. Ratings of these groups for specific activities are given in table 5. The limitations of the soils for use as filter fields for septic tank systems are shown in table 7, page 78, in the subsection "Engineering Interpretations of the Soils."

TABLE 5.—*Estimated degree and kind of limitations of the soils for recreational uses*

[The ratings slight, moderate, severe are defined in the text]

Recreation group and mapping symbols	Campsites	Picnic areas	Intensive play areas	Extensive recreation areas	Shoreline developments	Access roads and parking lots
Group 1 (131A, V131, 175A, 266, 344, 462A, 463A).	Slight	Slight	Slight	Slight	Slight	Slight.
Group 2 (131B, 131C, 131C2, 175B, 175C, 214B, 214C, 214C2, 308B, 308C, 308C2, 453C, 462B, 462C2, 463B, 463C2).	Slight	Slight	Moderate; gently or moderately sloping.	Slight	Slight	Slight; but cuts in 214B, 214C, and 214C2 may seep.
Group 3 (75D ,131D2, 214D2, 308D, 308D2, 453D2, 462D2).	Moderate; strongly sloping.	Moderate; strongly sloping.	Severe; strongly sloping.	Slight	Moderate; strongly sloping.	Moderate; strongly sloping; cuts in 214D2 may seep.
Group 4 (214C3, 214D3, 308D3, 453D3, 462C3, 462D3).	Moderate; strongly sloping; texture of surface layer unfavorable.	Moderate; strongly sloping; texture of surface layer unfavorable.	Severe; strongly sloping; texture of surface layer unfavorable.	Slight	Moderate; strongly sloping; erodible.	Moderate; strongly sloping; cuts in 214C3 and 214D3 may seep.
Group 5 (214E2, 216E, 308E2, 453E2).	Severe; moderately steep.	Severe; moderately steep.	Severe; moderately steep.	Slight	Moderate; moderately steep.	Moderate; moderately steep; road cuts in 214E2 may seep.
Group 6 (214E3, 308E3, 453E3, 463E3).	Severe; moderately steep; texture of surface layer unfavorable.	Severe; moderately steep; texture of surface layer unfavorable.	Severe; moderately steep.	Slight	Moderate; moderately steep; erodible.	Moderate; moderately steep; sticky and muddy when wet; road cuts in 214E3 may seep.

[7] CLIFFORD C. MILES, soil scientist, Soil Conservation Service, assisted in the preparation of this section.

TABLE 5.—*Estimated degree and kind of limitations of the soils for recreational uses*—Continued

Recreation group and mapping symbols	Campsites	Picnic areas	Intensive play areas	Extensive recreation areas	Shoreline developments	Access roads and parking lots
Group 7 (214F2, 214F3, 216F, 216F3, 308F, 308F2, 308F3, 453F3).	Severe; steep	Severe; steep	Severe; steep	Moderate; steep.	Severe; steep	Severe; steep; road cuts in 214F2 and 214F3 may seep.
Group 8 (216G, 471G, 990F, 990G).	Severe; very steep.	Severe; very steep; cherty.	Severe; very steep; cherty.	Moderate; very steep.	Severe; very steep.	Severe; very steep; cherty.
Group 9 (53B, 92)	Moderate; sandy surface layer; poor vegetation; blowing sand.	Moderate; sandy surface layer; blowing sand; poor vegetation.	Severe; sandy surface layer; blowing sand; droughty; difficult to establish vegetation.	Moderate; difficult to establish vegetation; poor foot and vehicle trafficability.	Moderate; difficult to establish vegetation; sand may provide good beach area.	Severe; road cuts may slough; sandy; poor traction for vehicles.
Group 10 (164A, 164B, 184A, 184B, 219, 338A, 338B, 461A, 461B, 467C3).	Moderate to slight; somewhat poorly drained.	Moderate to slight; somewhat poorly drained.	Moderate; sloping; somewhat poorly drained.	Slight	Moderate to slight; somewhat poorly drained.	Moderate to slight; somewhat poorly drained.
Group 11 (84, 109, 165, 178, 401, 460).	Moderate to severe; poor drainage.	Severe to moderate; poor drainage; low productivity.	Severe to moderate; poor drainage; low productivity.	Moderate; poor drainage.	Moderate; poor drainage; low productivity.	Severe to moderate; poor drainage.
Group 12 (72, 304A, 304B, 306, 331, 456A, 456B, 475).	Moderate if subject to overflow; slight if protected.	Moderate if subject to overflow; slight if protected.	Moderate if subject to overflow; slight if protected.	Slight	Moderate if subject to overflow; slight if protected.	Moderate if subject to overflow; slight if protected.
Group 13 (162A, 162B, 284A, 284B, 452A, 452B, 452C).	Moderate; somewhat poorly drained; surface soil sticky when wet; possibility of flooding.	Moderate; somewhat poorly drained; surface soil sticky when wet; possibility of flooding.	Moderate; somewhat poorly drained; surface soil soil sticky when wet; possibility of flooding.	Moderate if subject to overflow; slight if protected.	Moderate; somewhat poorly drained; surface soil sticky when wet.	Moderate; wet and muddy after rains; possibility of flooding.
Group 14 (161, 180, 333, 382)	Moderate; somewhat poorly drained; possibility of flooding.	Moderate; somewhat poorly drained; possibility of flooding.	Moderate; somewhat poorly drained; possibility of flooding.	Moderate if subject to overflow; slight if protected.	Moderate; somewhat poorly drained; possibility of flooding.	Moderate; soil remains wet after rains and in spring; possibility of flooding.
Group 15 (108, 334, 422+)	Severe; poorly drained; subject to flooding.	Severe; poorly drained; slow to dry out after rains; subject to flooding.	Severe; poorly drained; slow to dry out after rains; subject to flooding.	Moderate; poorly drained; subject to flooding.	Moderate to severe; poorly drained; subject to flooding.	Moderate to severe; poorly drained; slow to dry after rains and in spring; subject to flooding.
Group 16 (70, 70+, 71A, 71C, 85, 284+, 288, 420, 422, 426, 525, 589A, 589B, 590A, 590B).	Severe; poorly drained; subject to flooding; clayey surface soil sticky when wet.	Severe; poorly drained; clayey surface soil sticky when wet, cracks when dry; subject to flooding.	Severe; poorly drained; clayey surface soil sticky when wet, cracks when dry; subject to flooding.	Severe; poorly drained; bare areas sticky and muddy, when wet; subject to flooding.	Severe; poorly drained; surface soil sticky and muddy when wet; subject to flooding.	Severe; often wet, sticky, and muddy; subject to flooding.
Group 17 (W71, W108, 108+, W288, W420, W422, W426, 455, W590).	Severe; extremely wet or frequently overflowed.	Severe; extremely wet or frequently overflowed.	Severe; extremely wet or frequently overflowed.	Severe; extremely wet or frequently overflowed.	Severe; extremely wet or frequently overflowed.	Severe; extremely wet or frequently overflowed.

The ratings in table 5 show the estimated limitations imposed by soil properties in areas used for recreation.

A rating of *slight* indicates that no problems are expected, or that they can be dealt with in the normal course of construction.

A rating of *moderate* indicates that problems exist that will require special construction methods or careful planning, or that the site is of medium quality.

A rating of *severe* indicates that special planning or major corrective measures are needed, or that the site is either of low quality or not suited to the use specified.

These ratings are general, and onsite investigation is necessary for detailed planning.

Following are descriptions of the outdoor recreational uses for which the soils are rated in table 5.

Campsites are areas suitable for tents or trailers and for living activities for a limited time during the camping season. Little preparation is needed, but an attractive landscape and good foot trafficability are important.

Picnic areas include areas suitable for picnic tables and unsurfaced auto parking lots. Good foot trafficability, good ground cover, and an attractive landscape are important. Ratings do not include suitability for picnic shelters or toilets, or the presence of trees.

Intensive play areas are areas suitable for playgrounds and organized games, such as baseball, football, or tennis. They require a level surface, good drainage, and good foot trafficability.

Extensive recreation areas are those suitable for nature study, conservation education, cross-country hiking, footpaths, bridle paths, and other nonintensive uses that allow for the random movement of people. There are few restrictions because of soil conditions.

Shoreline developments include the first 10 to 20 feet of land above the water line. They do not include the area below the water line. Their use includes sunbathing, bank fishing, boating facilities, protection from wave action, and scenic value. Foot trafficability, slope, and soil productivity are the principal considerations.

Access roads and parking lots require conditions suitable for gravel or dirt roads and parking areas. Slope, cuts and fills, soil texture, and wetness are major considerations.

Related information is in the sections "Use of the Soils For Engineering" and "Use of the Soils For Wildlife." Certain information in the sections "Management by Groups of Soils" and "Use of the Soils for Woodland" may be helpful. Advice and assistance on seedbed preparation, soil and water conservation, and area plantings can be obtained from your local Soil Conservation Service office, the Extension Service office, or a landscape architect.

Recreation suitability groups

The soils of Pulaski and Alexander Counties have been placed in 17 recreation groups according to their suitability for various recreational uses. These groups are discussed in the following paragraphs.

To find what recreation group a specific soil is in, refer to the "Guide to Mapping Units," which is at the back of this survey.

RECREATION GROUP 1

This group consists of well drained or moderately well drained, moderately permeable soils of the Alvin, Disco, Harvard, Lamont, Sciotoville, and Wheeling series. Although these soils are level or nearly level, they are not subject to ponding. They are good for recreation areas but generally are in demand for more intensive use because they are moderately or highly productive.

Many of these soils, particularly those that have a sandy surface layer, are underlain by sand. Thus, nearby water sources are likely to be contaminated if these areas are used as filter fields for septic tanks. The soils that have a fine sandy loam surface layer are somewhat better suited to unvegetated intensive play areas than those that have a silt loam surface layer. Other than this, the soils of this group have few or no limitations that restrict their use for recreation areas.

RECREATION GROUP 2

In this group are gently sloping to moderately sloping soils of the Alford, Alvin, Hosmer, Muren, Lamont, Sciotoville, and Wheeling series. These soils have a silt loam or fine sandy loam surface layer and are well drained or moderately well drained. The Hosmer soils are slowly permeable, and the other soils are moderately to moderately rapidly permeable. All are moderately to highly productive. They have few limitations that would restrict their use for recreation areas.

The Hosmer soils have a fragipan that begins at a depth of 24 to 36 inches and is from 2 to 3 feet thick. The pan is slowly permeable, and it severely limits the percolation rate of septic-tank effluent. The other soils in this group have few or no limitations that restrict their use as sites for buildings with septic tanks. If the sandy Alvin or Lamont soils are used as filter fields, care needs to be taken to prevent the contamination of local water sources by effluent that percolates through the very sandy substratum.

These sloping soils have moderate limitations for use as intensive play areas, since they would require leveling for most activities. They are subject to water erosion if disturbed for construction purposes or if the vegetation is sparse or lacking.

RECREATION GROUP 3

This group consists of strongly sloping soils of the Alford, Alvin, Drury, Hosmer, Muren, and Sciotoville series. These soils have a silt loam or fine sandy loam surface layer, are well drained or moderately well drained, and are moderately productive. The Hosmer soils are slowly permeable, and the other soils are moderately or moderately slowly permeable. All have moderate limitations for many recreational uses because of the slope.

The Hosmer soils are severely limited for use as septic-tank filter fields because of a slowly permeable fragipan, which begins at a depth of about 24 to 30 inches. The pan severely limits the percolation rate of septic-tank effluent. The other soils in this group have few or no limitations that restrict their use as sites for buildings with septic tanks. In filter fields on hillsides, tile lines should be laid on the contour.

Because of their slope, these soils have moderate limitations for use as campsites, picnic areas, or beaches along lakeshores. They have severe limitations for use as intensive play areas, which include tennis courts, baseball diamonds, and other facilities that require level sites.

These soils are easily seeded to plants that provide good ground cover. They are subject to serious erosion if the vegetation is not maintained.

RECREATION GROUP 4

In this group are moderately to strongly sloping soils of the Alford, Hosmer, Muren, and Sciotoville series. These soils are similar to those of group 3, except that they are severely eroded. They generally have a silty clay loam surface layer and are well drained or moderately well drained. The Hosmer soils are slowly permeable, the Sciotoville are moderately slowly permeable, and the Alford and Muren are moderately permeable. All are moderately productive. They have moderate limitations for many recreational uses because of the slope and the clayey surface layer.

The Hosmer soils contain a fragipan that seriously restricts the movement of water. Consequently, they are severely limited for use as filter fields for septic tanks. The other soils of this group are suitable sites for buildings with septic tanks if the tile lines are installed on the contour. Because of the clayey surface layer, these severely eroded soils have more surface runoff and remain wet and muddy longer after rains than the less eroded soils of group 3, and they are more likely to become hard or cloddy when dry. Consequently, they are less well suited to many recreational uses. Plants that provide a good ground cover are difficult to establish and to maintain, but further erosion is a serious hazard if the vegetation is not maintained.

Because of the slope, these soils have moderate limitations for such uses as campsites or picnic areas. They have severe limitations for use as intensive play areas, which include croquet courts, tennis courts, and other facilities that require level sites.

RECREATION GROUP 5

In this group are moderately steep soils of the Alford, Hosmer, Muren, and Stookey series. These soils have a silt loam surface layer and are well drained or moderately well drained, but they have moderate or severe limitations for most recreational uses because of their slope. They are productive, and plants that provide a good ground cover are easily established. The Hosmer soil is slowly permeable, and the other soils are moderately permeable.

The Hosmer soil contains a fragipan that seriously restricts the movement of water. This soil is severely limited for use as filter fields because it is slowly permeable and moderately steep. The other soils are severely limited because of the steep slopes and the likelihood of effluent seeping to the surface. The location and design of buildings are limited to some extent by the slope.

Slope severely limits the suitability of these soils for campsites, picnic areas, and intensive play areas.

These soils are subject to serious erosion. Thus, it is necessary to protect them with a good ground cover of vegetation, particularly in heavily used areas.

RECREATION GROUP 6

In this group are moderately steep soils of the Alford, Hosmer, Muren, and Wheeling series. These soils are similar to those in group 5, but they are severely eroded. Thus, they generally have a silty clay loam surface layer. They are well drained or moderately well drained and are fairly productive. Plants that provide a good ground cover can be established and maintained if management is good. The Hosmer soils are slowly permeable, and the other soils are moderately permeable.

The Hosmer soils contain a fragipan that seriously restricts the movement of water. Consequently, they are severely limited for use as filter fields. Although the other soils are more permeable, they are also rated as severely limited for use as filter fields because of their steep slopes. The location and design of all buildings are limited to some extent by the slope.

Slope severely limits the suitability of these soils for campsites, picnic areas, and intensive play areas. In addition, because of the clayey surface layer, these severely eroded soils have rapid or very rapid surface runoff, are wet and muddy for long periods after rains, and are hard and cloddy when dry.

These soils are subject to severe erosion and need to be protected by a good ground cover of vegetation, particularly in heavily used areas. If feasible, gullied areas should be leveled or shaped and then seeded.

RECREATION GROUP 7

This group consists of steeply sloping soils of the Alford, Hosmer, Muren, and Stookey series. These soils ordinarily have a silt loam surface layer, but in severely eroded areas the surface layer is silty clay loam. These soils are well drained or moderately well drained, are moderately or slowly permeable, and are fairly productive. They are subject to further erosion and are severely limited for most recreational uses because of the steep slopes.

These soils have severe limitations for use as building sites. The steep slopes limit both the location and design of buildings and make the installation of sewage disposal systems costly and inconvenient. The Hosmer soils contain a fragipan that seriously restricts the movement of water.

The soils of this group are suitable for extensive recreation areas, which include nature-study areas, conservation areas, footpaths, and bridle paths. Such areas need a protective ground cover for control of erosion. Natural vegetation is most desirable, but other ground cover can be planted if natural cover is lacking. Paths and roads ought to be constructed on the contour, both for convenience and to minimize the erosion hazard.

RECREATION GROUP 8

Very steep soils make up this group. These soils consist of deep silt loams and shallow cherty soils of the Bodine and Stookey series. They are well drained, are moderately permeable, and are low or medium in productivity. The chert and the very steep slopes limit the suitability of these soils for recreational uses. They are suitable principally for extensive play areas, which include nature-study areas, conservation areas, cross-country hiking trails, footpaths, and bridle paths. Development is confined to restocking suitable kinds of trees and other natural vegetation, laying out and developing paths or trails, and controlling undesirable plants and animals.

RECREATION GROUP 9

This group consists of level to moderately sloping soils of the Bloomfield and Sarpy series. These soils have a loamy fine sand surface layer, are well drained to excessively drained, and are rapidly permeable. They generally have moderate limitations for use as recreation areas because droughtiness, low organic-matter content, and low fertility make the establishment and maintenance of a good ground cover difficult. Vegetation is needed to help

control wind erosion and to provide suitable ground cover for campsites, picnic grounds, and other intensive play areas. The sandy surface layer is somewhat unsatisfactory as a base for unsurfaced roads, parking areas, and paths.

These soils provide satisfactory sites for buildings, although lawns and other plantings may be difficult to maintain. Because percolation is rapid, care must be taken to prevent the contamination of local water supplies if these very sandy soils are used as filter fields.

Where these soils are near shorelines, they have possibilities for use as beach areas.

RECREATION GROUP 10

This group consists of level to sloping soils of the Hurst, Markland, Millbrook, Roby, Stoy, and Weinbach series. These soils for the most part are poorly drained and have a silt loam or fine sandy loam surface layer. The Markland soils are moderately well drained, are severely eroded, and have a silty clay loam surface layer. All are moderately to very slowly permeable and generally are medium in productivity.

Wetness caused by slow permeability and surface ponding is a moderate limitation for most recreational uses in the level to slightly sloping areas. In slightly sloping to moderately sloping areas, which have better surface drainage, the limitation generally is slight.

Level and nearly level areas need to be artificially drained, and even if drained they remain wet and muddy until late in spring. Thus, the limitation is greater for year-round activities than for summer use.

Because of the shrink-swell potential of the subsoil, these soils have moderate limitations that restrict their use as sites for cottages and service buildings. Wetness is also a limitation in level areas. These soils are severely limited for use as filter fields.

RECREATION GROUP 11

This group is made up of level, poorly drained, slowly to very slowly permeable soils of the Ginat, Okaw, Racoon, Ruark, and Weir series. These soils have a silt loam, very fine sandy loam, or silty clay loam surface layer. They generally are low in productivity and may be ponded in wet weather. The subsoil has high shrink-swell potential.

Wetness, caused by slow or very slow permeability and surface ponding, moderately or severely limits the use of these soils for recreation areas. The severity of the limitation depends both on the duration of surface ponding and on the amount of artificial drainage installed. These soils are wet and muddy late in spring. Thus, the limitation is greater for year-round or long-season activities, such as picnicking or sports, than for summer activities, such as camping. It is also greater for roads and parking lots than for foot traffic.

The use of these soils for cottages and service buildings is limited by wetness and ponding and by the high shrink-swell potential of the subsoil, which affects the stability of foundations. The choice of plants for lawns and shrubs is limited by wetness in spring and by droughtiness in midsummer. These soils have severe limitations for use as filter fields.

RECREATION GROUP 12

This group consists of level to gently sloping soils of the Allison, Elsah, Haymond, Landes, Sharon, and Ware series. These soils are on bottom lands. They have a silt loam, fine sandy loam, or silty clay loam surface layer, and they are moderately or moderately rapidly permeable, well drained or moderately well drained, and highly productive. The Ware soils are underlain by loamy fine sand, and the Elsah soils by cherty gravel.

The use of the soils as recreation areas is limited principally by the hazard of overflow. The areas not subject to overflow have few if any limitations for recreational use. The Elsah, Haymond, and Sharon soils occur mainly on small bottom lands that are often subject to flash floods from nearby hills. The construction of diversions and the improvement of channels would help to prevent the concentration of water in these areas. The Allison, Landes, and Ware soils are on bottom lands along the Mississippi and Ohio Rivers and are subject to flooding if not protected by levees. Flooding severely limits the type of buildings that can be constructed. It also causes moderate limitations for other uses. For example, picnic tables must be firmly anchored, and playgrounds and golf greens must be of a type not damaged by overflow.

The Landes and Ware series are underlain by sand. If these soils are used as filter fields, care is needed to prevent the contamination of local water supplies.

RECREATION GROUP 13

In this group are level to gently sloping, somewhat poorly drained or poorly drained silty clay loams of the Gorham, Riley, and Tice series. These soils are on bottom lands along the Mississippi River. They are moderately permeable and are highly productive. Wetness and the hazard of flooding limit their use as recreation areas.

Areas not protected by levees have severe limitations if used as sites for buildings and moderate limitations for most other recreational uses. Flooding normally occurs only in spring but must be considered in the location of picnic areas, baseball diamonds, golf greens, or other areas where equipment or facilities remain in place.

Because of slow surface runoff and the fine texture of the surface layer, both protected and unprotected areas tend to remain wet and muddy for long periods after rains. Thus, they have moderate limitations for most recreational uses. The Riley soils dry out faster than the Gorham and Tice soils.

The Gorham and Riley soils are underlain by sand. If they are used for filter fields, care must be taken to prevent the contamination of nearby water supplies.

RECREATION GROUP 14

This group consists of level to gently sloping, somewhat poorly drained silt loams of the Belknap, Dupo, Newart, and Wakeland series. These soils are on bottom lands. They have a silt loam surface layer, are moderately permeable or moderately slowly permeable, and are moderately to highly productive. They are subject to overflow if not protected by levees. Wetness and overflow generally are moderate limitations if these soils are used for recreation areas.

Most areas of the Belknap, Dupo, and Wakeland soils are subject to flash floods, and the areas along the Cache River are subject to overflow. The construction of levees or diversions or the improvement of channels may be desirable in some locations. The Newart and Dupo soils along the Mississippi River are subject to flooding in spring if not protected by levees. Thus, flooding severely

limits the use of these soils as sites for buildings and moderately limits their use as campsites, picnic areas, playgrounds, golf courses, or other areas where equipment or facilities remain the year round.

Somewhat poor drainage, both in protected and unprotected areas, causes these soils to dry out slowly in spring and after heavy rains, and level areas may be ponded after rains. Consequently, the soils of this group have moderate limitations for most recreational uses.

Careful consideration is needed in locating filter fields. Filter fields should never be located where there is a hazard of overflow, because overflow halts their operation, spreads sewage, and creates unhealthful conditions downstream. The Newart soils are underlain by sand, and there is the possibility that nearby water supplies will be contaminated. The Belknap, Dupo, and Wakeland soils are moderately slowly permeable and are not likely to be satisfactory for use as filter fields.

RECREATION GROUP 15

In this group are mainly level or nearly level, poorly drained soils of the Birds, Bonnie, Cape, and Karnak series. These soils have a silt loam surface layer, are slowly to very slowly permeable, and are moderate or low in productivity. Wetness and overflow limit their suitability for recreation developments.

These soils occur principally on bottom lands along the Cache River, and many of these areas are subject to overflow. Some areas of the Cape and Karnak soils are on bottom lands along the Mississippi River. These areas are subject to flooding unless protected by levees. Overflow limits their use as building sites and as locations for recreation facilities where equipment must remain in place the year around.

These soils are slow to dry out after rains, and many areas remain ponded for long periods. Consequently, they are limited for use as picnic areas, playgrounds, parking lots, and other areas that receive intensive foot or vehicle traffic. Where overflow is not a problem and an adequate drainage system is installed, the limitation is moderate.

Poor drainage and ponding are severe limitations if these soils are used as sites for buildings. Basements generally are not feasible. Because they are slowly or very slowly permeable, the soils of this group are severely limited for use as filter fields. All except the Birds and Bonnie soils are underlain by heavy clay, which has high shrink-swell potential and low bearing strength. Foundations that extend into such material are likely to shift and crack.

RECREATION GROUP 16

This group consists of poorly drained to very poorly drained soils of the Beaucoup, Bowdre, Cairo, Cape, Darwin, Jacob, Karnak, Petrolia, Piopolis, and Tice series. These soils occur in level or nearly level areas and depressions. They have a silty clay loam, silty clay, or clay surface layer, are moderately slowly permeable to very slowly permeable, and are low to high in productivity. The water table generally is high, and there are many ponded areas. Excess water severely limits the use of these soils for recreation areas.

These soils, as a whole, are subject to flooding or overflow. Some areas on bottom lands along the Mississippi River are protected by levees. Within the levees, however, depressions and sloughs are subject to ponding or flooding by runoff from adjacent higher areas. Even in areas protected from overflow and artificially drained, the heavy clayey surface layer is slow to dry out and when wet is muddy and sticky. The soils that have a silty clay loam surface layer are somewhat better drained than those that have a silty clay or clay surface layer. Nevertheless, wetness limits the suitability of these soils for most recreational uses. During the drier part of the year, these soils can be used for nature-study areas, hiking trails, or footpaths.

A high water table, very slow permeability, and overflow severely limit the use of these soils for filter fields. The Beaucoup or Petrolia soils, which are more permeable than the other soils, and the Bowdre and Cairo soils, which are underlain by sand, can be used for filter fields if more suitable areas are not available. If the Bowdre and Cairo soils are used for this purpose, care needs to be taken to prevent the contamination of nearby water supplies.

These soils have a high shrink-swell potential and low bearing strength; consequently foundations are likely to shift or crack. The choice of plants is limited to those tolerant of wetness.

RECREATION GROUP 17

Very wet soils of the Bonnie, Cape, Darwin, Karnak, Petrolia, and Piopolis series and Alluvial land make up this group. These soils are on bottom lands and are ponded, are frequently overflowed, or have a high water table for more than 6 months during the year. The surface layer ranges from silt loam to silty clay. Wetness makes these soils unsuitable for most recreational uses.

These soils can be used for nature-study areas, hiking trails, or footpaths during the drier part of the year. They generally are not suited to other recreational uses.

If drained and protected from overflow, these soils would be in group 14, 15, or 16.

Use of the Soils for Engineering [8]

Some soil properties are of special interest to engineers because they affect the construction and maintenance of engineering projects. The soil properties most important to engineers are permeability to water, shear strength, compaction characteristics, soil drainage, shrink-swell characteristics, grain size, plasticity, and reaction. Also important are depth to the water table, flooding hazard, depth to bedrock, and topography.

With the use of the soil map for identification, the engineering interpretations reported here can be useful for many purposes. It should be emphasized that they do not eliminate the need for sampling and testing at the site of specific engineering works involving heavy loads and excavations deeper than the depth of layers here reported. Even in these situations, the soil map is useful for planning more detailed field investigations and for suggesting the kinds of problems that may be expected.

Information in this section can be used by engineers in—

1. Making studies that will aid in selecting and developing sites for industrial, commercial, residential, and recreational purposes.

[8] HERBERT L. DAVENPORT, agricultural engineer, Soil Conservation Service, assisted in the preparation of this section.

2. Making preliminary estimates of engineering properties of the soils to be used in planning agricultural drainage systems, farm ponds, irrigation systems, and erosion control practices.
3. Making preliminary evaluations of soils and sites that will aid in selecting locations for highways, airports, pipelines, and cables, and in planning detailed investigations of the selected locations.
4. Locating probable sources of sand, gravel, and other construction materials.
5. Correlating performance of engineering structures with soil mapping units to develop information that will be useful in designing and maintaining such structures.
6. Supplementing information obtained from other published maps, reports, and aerial photographs for the purpose of preparing maps and reports that can be used readily by engineers.
7. Developing other preliminary estimates for construction purposes pertinent to a particular area.

Some of the terms used in this survey may have special meaning in soil science. These terms, as well as other special terms, are defined in the Glossary at the back of this publication.

The engineering data are presented in three tables. Table 6 gives the estimated physical and chemical properties of the soils; table 7 shows the estimated suitability of the soils for construction and conservation engineering; table 8 lists test data for 6 soil types from 10 soil profiles that were sampled in Pulaski and Alexander Counties.

Engineering classification systems

Most highway engineers classify soil materials in accordance with the system approved by the American Association of State Highway Officials (AASHO) (*1*). In this system soil materials are classified into seven basic groups that range from A–1 (gravelly soils of high bearing capacity, the best soils for subgrades) to A–7 (clayey soils having low strength when wet, the poorest soils for subgrades). Within each basic group the relative engineering value of the soil material is indicated by a group index number. Group indexes range from 0 for the best material to 20 for the poorest. The group index number is shown in parentheses following the basic group symbol.

Some engineers prefer to use the Unified soil classification system (*27*). In this system soil material is divided into 15 classes. Eight classes are for coarse-grained material (GW, GP, GM, GC, SW, SP, SM, SC); six classes are for fine-grained material (ML, CL, OL, MH, CH, OH); and one class is for highly organic material (Pt).

Engineering properties of the soils

In table 6 the soil series in the two counties and the map symbols for each are listed and estimates of some of the physical and chemical properties of the soils are given. The estimated physical properties are those of the typical soil. Where test data are available, that information was used. Where tests were not performed, the estimates shown are based on comparisons with soils that were tested in Pulaski and Alexander Counties and with similar soils in other counties.

Permeability of the soil as it occurs in place was estimated. The estimates are based on the structure, porosity, and consistency of the soil material and on field observations. The estimates were compared with permeability tests on undisturbed cores of similar soil materials.

Available water capacity refers to the approximate amount of capillary water in a soil that is wet to field capacity. In table 6, the capacity is expressed as inches per inch of soil. When the soil is air dry, this same amount of water will wet the soil material to a depth of 1 inch without deeper percolation. The estimates are based on data from undisturbed soil samples or from field measurements of selected soils.

Shrink-swell potential is an indication of the volume change to be expected of the soil material with changes in moisture content. It depends on the amount and type of clay in the soil. In general, soils classified as A–7 and CH have high shrink-swell potential. Clean sands and gravels (single-grain structure) and those having a small amount of nonplastic to slightly plastic fines have low shrink-swell potential, as does most other nonplastic to slightly plastic soil material. Building foundations, roads, and other structures may be severely damaged by the shrinking and swelling of soils.

Some soils tend to cause corrosion of underground metal conduits and pipes. The corrosion potential is influenced by soil texture, by the amount and type of clay in the soil, by total acidity, by the amount and kind of soluble salts present, by moisture content of the soil, and by conduit material. Estimates of corrosion rates are given in table 6 for the soil horizons in which conduits would likely be buried. Because of the many variables involved, both natural and manmade, only three broad ratings of high, moderate, and low were made. The likelihood of corrosion is greater if installations cross soil boundaries or horizon boundaries or if they are entirely in one kind of soil or one horizon. Corrosion engineers may be able to make more precise evaluations of corrosion potential for specific kinds of conduits by reading the detailed soil descriptions in the section "Formation, Morphology, and Classification of Soils."

Engineering interpretations of the soils

Table 7 lists specific features of the soils that may affect the selection, design, and construction of various engineering works. These features are evaluated from test data and from field experience. A particular feature of a soil may be helpful in one kind of engineering work but may be a hindrance in another. For example, a highly permeable substratum is not desirable for a pond site but could be an advantage in artificial drainage. For sewage disposal use, the soil must have an acceptable percolation rate, without interference from ground water or underlying impervious strata. Some soils meet these requirements but are subject to overflow, which interferes with the functioning of the sewage disposal system. Other soils are moderately or rapidly permeable and are free of ground-water interference, an impervious stratum, or overflow. These soils function well as filter fields for septic tanks, but in some the substratum is so rapidly permeable that nearby water supplies may be contaminated by the effluent. Other soils are limited only by excessive slopes. Here, the problem is mainly the difficulty of installing and maintaining the tile system. In table 7, the degree of limitation and the factors influencing the use of the soils for filter fields for septic-tank systems are based on these considerations.

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TABLE 6.—*Estimated physical and*

Soil and map symbols	Depth from surface	Classification		
		USDA texture	Unified	AASHO
	Inches			
Alford (308B, 308C, 308C2, 308D, 308D2, 308D3, 308E2, 308E3, 308F, 308F2, 308F3).	0 to 10	Silt loam	ML	A-4
	10 to 42	Silty clay loam	CL	A-6 or A-7-6
	42 to 60	Silt loam	ML or CL	A-4 or A-6
Allison (306).	0 to 60	Silty clay loam	CL	A-6 or A-7
Alluvial land (455). Variable; no estimates of engineering properties.				
Alvin:				
Fine sandy loam (131A, 131B, 131C, 131C2, 131D2).	0 to 18	Fine sandy loam	SM or ML	A-2 or A-4
	18 to 36	Sandy clay loam	SC or CL	A-4 or A-6
	36 to 60	Loamy fine sand	SP, SW or SM.	A-2 or A-3
Fine sandy loam, thick A2 horizon variant (V131).	0 to 30	Fine sandy loam	SM or ML	A-2 or A-4
	30 to 50	Sandy clay loam	SC or CL	A-6
	50 to 60	Stratified layers of loamy fine sand to clay loam.	(3)	(3)
Beaucoup (70, 70+).	0 to 60	Silty clay loam	CL	A-6 or A-7
Belknap (382).	0 to 60	Silt loam	ML or CL	A-4
Birds (334).	0 to 60	Silt loam	ML or CL	A-4
Bloomfield (53B).	0 to 42	Loamy fine sand	SP or SM	A-2 or A-3
	42 to 48	Fine sandy loam	SM or SC	A-2 or A-4
	48 to 60	Fine sand	SP or SM	A-2 or A-3
Bodine (471G).	0 to 6	Cherty silt loam	GM or ML	A-4
	6 to 20	Very cherty heavy silt loam	GM	A-1, A-2, or A-4.
	20 to 30	Very cherty loam	GP, GM	A-1 or A-2
	30 to 72	Fractured chert		
	72	Chert bedrock		
Bonnie (108, W108, 108+).	0 to 60	Silt loam	ML or CL	A-4
Bowdre (589A, 589B).	0 to 12	Silty clay	CL or CH	A-7
	12 to 20	Clay loam to loam	ML or CL	A-4 or A-6
	20 to 60	Loamy fine sand	SM	A-2 or A-4
Cairo (590A, 590B, W590).	0 to 35	Silty clay	CL or CH	A-7
	35 to 60	Fine sand	SM	A-2 or A-4
Cape (422, 422+, W422). For Karnak part of these units, see Karnak series.	0 to 24	Silty clay loam to silt loam	CL	A-6
	24 to 60	Silty clay	CH	A-7
Darwin:				
Silty clay (71A, 71C, W71).	0 to 60	Silty clay to clay	CH	A-7-6
Silty clay loam (525).	0 to 20	Silty clay loam	CL or CH	A-6 or A-7-6
	20 to 60	Silty clay	CH	A-7-6
Disco (266).	0 to 15	Fine sandy loam	SM or ML	A-2 or A-4
	15 to 30	Loam	ML	A-4
	30 to 60	Loamy fine sand	SM	A-2 or A-4
Drury (75D).	0 to 60	Silt loam	ML or CL	A-4 or A-6
Dupo (180).	0 to 24	Silt loam	ML or CL	A-4 or A-6
	24 to 60	Silty clay to silty clay loam	CL or CH	A-6 or A-7

See footnote at end of table

chemical properties of soils

Percent passing sieve— No. 4 (4.7 mm.)	No. 10 (2.0 mm.)	No. 200 (0.074 mm.)	Permeability [1]	Available water capacity	Reaction	Shrink-swell potential	Corrosion potential for metal conduits
			Inches per hour	*Inches per inch of soil*	*pH*		
100	100	95 to 100	0. 63 to 2. 0	0. 20	6. 1 to 7. 3	Low	(2).
100	100	95 to 100	0. 63 to 2. 0	0. 19	5. 1 to 6. 5	Moderate	Moderate.
100	100	95 to 100	0. 63 to 2. 0	0. 18	4. 5 to 5. 0	Low to moderate	Moderate.
100	100	90 to 100	0. 63 to 2. 0	0. 20	6. 6 to 7. 3	Moderate	Moderate.
100	100	30 to 60	2. 00 to 6. 3	0. 15	5. 1 to 5. 5	Low	(2).
100	100	40 to 65	0. 63 to 2. 0	0. 16	5. 1 to 5. 5	Low to moderate	Low.
100	100	5 to 20	>6. 3	0. 08	5. 6 to 6. 0	Low	Low.
100	100	30 to 60	2. 00 to 6. 3	0. 15	5. 1 to 5. 5	Low	(2).
100	100	35 to 65	0. 20 to 2. 0	0. 16	5. 1 to 5. 5	Low to moderate	Low.
(3)	(3)	(3)	(3)	(3)	5. 6 to 6. 0	Low	Low.
100	95 to 100	70 to 95	0. 20 to 0. 63	0. 19	6. 1 to 7. 3	Moderate to high	High.
100	95 to 100	70 to 95	0. 20 to 0. 63	0. 19	5. 1 to 6. 0	Low to moderate	High.
100	100	90 to 100	0. 06 to 0. 2	0. 18	6. 1 to 7. 3	Low to moderate	High.
100	100	5 to 35	>6. 3	0. 06 to 0. 08	5. 6 to 6. 5	Low	Low.
100	100	25 to 45	2. 00 to 6. 3	0. 10	5. 6 to 6. 5	Low	Low.
100	100	5 to 35	>6. 3	0. 04	5. 6 to 6. 5	Low	Low.
50 to 90	50 to 85	45 to 85	0. 63 to 2. 0	0. 18	4. 5 to 5. 5	Low	Low.
30 to 75	25 to 70	20 to 50	0. 63 to 2. 0	0. 16	4. 5 to 5. 5	Low	Low.
10 to 35	5 to 30	5 to 25	0. 63 to 2. 0	0. 02 to 0. 04	4. 5 to 5. 5	Low	Low.
							(2).
							(2).
100	100	90 to 100	0. 06 to 0. 2	0. 18	5. 1 to 6. 0	Low to moderate	High.
100	100	95 to 100	0. 06 to 0. 2	0. 18	6. 6 to 7. 4	Moderate to high	(2).
100	100	70 to 85	0. 20 to 0. 63	0. 18	6. 6 to 7. 4	Moderate	(2).
100	100	20 to 50	>6. 3	0. 08	6. 6 to 7. 4	Low	Moderate.
100	100	95 to 100	0. 06 to 0. 2	0. 18	6. 6 to 7. 3	Moderate to high	High.
100	100	20 to 50	>6. 3	0. 06 to 0. 08	6. 6 to 7. 3	Low	Moderate.
100	100	95 to 100	0. 06 to 0. 2	0. 18	5. 1 to 6. 5	Moderate to high	High.
100	100	95 to 100	<0. 06	0. 16	5. 1 to 6. 0	High	High.
100	100	95 to 100	0. 06 to 0. 2	0. 17	6. 1 to 7. 3	High	High.
100	100	95 to 100	0. 20 to 0. 63	0. 20	6. 1 to 7. 3	Moderate to high	(2).
100	100	95 to 100	0. 06 to 0. 2	0. 16	6. 1 to 7. 3	High	High.
100	100	30 to 60	2. 00 to 6. 3	0. 16	5. 1 to 6. 0	Low	(2).
100	95 to 100	50 to 75	2. 00 to 6. 3	0. 15	5. 1 to 6. 0	Low	Low.
100	100	20 to 50	>6. 3	0. 06 to 0. 08	5. 1 to 6. 0	Low	Low.
100	100	95 to 100	0. 63 to 2. 0	0. 19	6. 1 to 7. 3	Low to moderate	Moderate.
100	100	95 to 100	0. 63 to 2. 0	0. 19	5. 1 to 6. 5	Low to moderate	(2).
100	100	95 to 100	0. 20 to 0. 63	0. 20	6. 1 to 7. 3	Moderate to high	High.

TABLE 6.—*Estimated physical and*

Soil and map symbols	Depth from surface	Classification		
		USDA texture	Unified	AASHO
	Inches			
Elsah (475).	0 to 24	Silt loam	ML	A-4
	24 to 60	Cherty loam	GP or GM	A-1
Ginat (460).	0 to 17	Silt loam	ML or CL	A-4 or A-6
	17 to 35	Silty clay loam to silty clay	CL	A-6 or A-7
	35 to 60	Silty clay loam	CL	A-6
Gorham (162A, 162B).	0 to 32	Silty clay loam	CL	A-6
	32 to 38	Silt loam	ML or CL	A-4 or A-6
	38 to 60	Fine sandy loam	SM or ML	A-2 or A-4
Harvard (344).	0 to 18	Silt loam	ML	A-4
	18 to 40	Silty clay loam to clay loam	CL	A-6
	40 to 60	Loam to silty clay loam	ML or CL	A-4 or A-6
Haymond (331).	0 to 60	Silt loam	ML	A-4
Hosmer (214B, 214C, 214C2, 214C3, 214D2, 214D3, 214E2, 214E3, 214F2, 214F3).	0 to 12	Silt loam	ML	A-4
	12 to 30	Silty clay loam to heavy silt loam	CL	A-6 or A-7
	30 to 40	Silty clay loam	CL	A-6 or A-7
	40 to 60	Silt loam	ML or CL	A-6
Hurst (338A, 338B).	0 to 12	Silt loam	CL	A-4 or A-6
	12 to 60	Silty clay to silty clay loam	CH	A-7
Jacob (85).	0 to 60	Clay	CH	A-7
Karnak (426, W426).	0 to 60	Silty clay	CH	A-7
Lamont (175A, 175B, 175C).	0 to 22	Fine sandy loam	SM or ML	A-2 or A-4
	22 to 42	Fine sandy loam to loam	ML or ML-CL	A-4
	42 to 60	Loamy fine sand	SM	A-2 or A-4
Landes (304A, 304B).	0 to 20	Fine sandy loam	SM or ML	A-4
	20 to 60	Loamy fine sand to fine sand	SM	A-2 or A-4
Markland (467C3).	0 to 10	Silty clay loam	CL	A-6
	10 to 60	Silty clay	CH or CL	A-7
Millbrook (219).	0 to 20	Silt loam	ML or CL	A-4 or A-6
	20 to 40	Silty clay loam to clay loam	CL or CH	A-6 or A-7
	40 to 60	Stratified layers of sandy and clayey materials.	[3]	[3]
Muren (453C, 453D2, 453D3, 453E2, 453E3, 453F3).	0 to 12	Silt loam or silty clay loam	ML or CL	A-4 or A-6
	12 to 45	Silty clay loam	CL	A-6 or A-7
	45 to 60	Silt loam	ML or CL	A-4 or A-6
Newart (161).	0 to 38	Silt loam	ML or CL	A-4
	38 to 60	Fine sandy loam	ML-CL, ML or SM.	A-4
Okaw:				
Silt loam (84).	0 to 14	Silt loam	ML	A-4
	14 to 60	Silty clay	CH	A-7
Silty clay loam (401).	0 to 10	Silty clay loam	CL	A-6
	10 to 60	Silty clay	CH	A-7
Petrolia (288, W288).	0 to 60	Silty clay loam	CL	A-6 or A-7
Piopolis (420, W420).	0 to 60	Silty clay loam	CL	A-6

See footnotes at end of table.

chemical properties of soils—Continued

Percent passing sieve—			Permeability [1]	Available water capacity	Reaction	Shrink-swell potential	Corrosion potential for metal conduits
No. 4 (4.7 mm.)	No. 10 (2.0 mm.)	No. 200 (0.074 mm.)					
			Inches per hour	*Inches per inch of soil*	*pH*		
100	100	95 to 100	0. 63 to 2. 0	0. 19	6. 1 to 7. 3	Low	[2].
15 to 35	10 to 30	5 to 25	0. 63 to 2. 0	0. 02 to 0. 04	6. 1 to 7. 3	Low	Low.
100	100	85 to 100	0. 63 to 2. 0	0. 18	5. 1 to 6. 5	Low to moderate	[2].
100	100	85 to 100	0. 06 to 0. 2	0. 16 to 0. 19	5. 1 to 6. 0	Moderate to high	High.
100	100	85 to 100	0. 2 to 0. 63	0. 19	5. 1 to 6. 0	Moderate	High.
100	100	95 to 100	0. 63 to 2. 0	0. 21	6. 6 to 7. 3	Moderate	[2].
100	100	85 to 100	0. 63 to 2. 0	0. 19	6. 6 to 7. 3	Low to moderate	Moderate.
100	100	25 to 60	2. 00 to 6. 3	0. 12	7. 4 to 7. 8	Low	Moderate.
100	100	95 to 100	0. 63 to 2. 0	0. 21	6. 1 to 7. 3	Low	[2].
100	100	95 to 100	0. 63 to 2. 0	0. 20	6. 1 to 6. 5	Moderate	Moderate.
100	100	95 to 100	0. 63 to 2. 0	0. 14 to 0. 19	6. 1 to 6. 5	Low to moderate	Moderate.
100	100	95 to 100	0. 63 to 2. 0	0. 19	6. 1 to 6. 5	Low	Low.
100	100	90 to 100	0. 63 to 2. 0	0. 20	5. 6 to 6. 0	Low to moderate	[2].
100	100	90 to 100	0. 20 to 0. 63	0. 19	5. 1 to 5. 5	Moderate	Moderate.
100	100	90 to 100	0. 06 to 0. 2	0. 05	5. 1 to 5. 5	Moderate	Moderate.
100	100	70 to 100	0. 06 to 0. 2	0. 05	5. 1 to 5. 5	Moderate	Moderate.
100	100	85 to 100	0. 63 to 2. 0	0. 19	5. 1 to 6. 0	Low to moderate	[2].
100	100	80 to 100	<0. 06	0. 15	4. 5 to 5. 5	High	High.
100	100	95 to 100	<0. 06	0. 15	4. 0 to 5. 0	High	High.
100	100	95 to 100	<0. 06	0. 16	6. 1 to 7. 3	High	High.
100	100	25 to 60	2. 00 to 6. 3	0. 14	5. 6 to 6. 0	Low	[2].
100	100	55 to 75	0. 63 to 6. 3	0. 15	5. 6 to 6. 0	Low	Low.
100	100	15 to 45	>6. 3	0. 6 to 0. 08	4. 5 to 5. 5	Low	Low.
100	100	35 to 65	2. 00 to 6. 3	0. 15	6. 6 to 7. 3	Low	[2].
100	100	15 to 45	>6. 3	0. 06 to 0. 08	6. 6 to 7. 3	Low	Low.
100	100	95 to 100	0. 20 to 2. 0	0. 19	5. 1 to 5. 5	Moderate	[2].
100	100	80 to 100	0. 06 to 0. 2	0. 16	5. 1 to 8. 4	High	High.
100	100	65 to 100	0. 63 to 2. 0	0. 21	6. 1 to 7. 3	Low	[2].
100	80 to 100	80 to 100	0. 20 to 0. 63	0. 20	5. 6 to 6. 0	Moderate to high	High.
100	[3]	[3]	[3]	[3]	5. 6 to 6. 0	Low	[3].
100	100	95 to 100	0. 63 to 2. 0	0. 20	5. 1 to 6. 0	Low to moderate	[2].
100	100	95 to 100	0. 63 to 2. 0	0. 19	5. 1 to 6. 0	Moderate	Moderate.
100	100	95 to 100	0. 63 to 2. 0	0. 18	5. 1 to 6. 0	Low to moderate	Moderate.
100	100	75 to 90	0. 63 to 2. 0	0. 21	6. 1 to 7. 3	Low	Moderate.
100	100	40 to 90	2. 00 to 6. 3	0. 12	7. 4 to 7. 8	Low	Moderate.
100	100	95 to 100	0. 20 to 0. 63	0. 18	4. 5 to 5. 5	Low to moderate	[2].
100	100	95 to 100	<0. 06	0. 15	4. 5 to 5. 5	High	High.
100	100	90 to 100	0. 20 to 0. 63	0. 19	4. 5 to 5. 5	Moderate to high	[2].
100	100	95 to 100	<0. 06	0. 15	4. 5 to 5. 5	High	High.
100	100	95 to 100	0. 20 to 0. 63	0. 19	6. 1 to 7. 3	Moderate to high	High.
100	100	95 to 100	0. 06 to 0. 2	0. 18	5. 1 to 6. 0	Moderate to high	High.

TABLE 6.—*Estimated physical and*

Soil and map symbols	Depth from surface	Classification		
		USDA texture	Unified	AASHO
	Inches			
Racoon (109).	0 to 30	Silt loam	ML or CL	A-4 or A-6
	30 to 50	Silty clay loam to silty clay	CL or CH	A-6 or A-7
	50 to 60	Silt loam	ML or CL	A-4 or A-6
Riley (452A, 452B, 452C).	0 to 22	Silty clay loam to loam	CL or ML	A-6 or A-4
	22 to 60	Loamy fine sand	SM	A-2 or A-4
Roby (184A, 184B).	0 to 18	Fine sandy loam	SM or ML	A-2 or A-4
	18 to 42	Loam to sandy clay loam	SC or CL	A-4, A-6, or A-2.
	42 to 60	Loamy fine sand	SM or ML	A-2 or A-4
Ruark (178).	0 to 20	Fine sandy loam	SM or ML	A-2 or A-4
	20 to 40	Clay loam	CL	A-4 or A-6
	40 to 60	Stratified layers of sandy and clayey materials.	(3)	(3)
Sarpy (92).	0 to 60	Loamy fine sand	SM	A-2 or A-4
Sciotoville (462A, 462B, 462C2, 462C3, 462D2, 462D3).	0 to 14	Silt loam	CL or CL-ML	A-4
	14 to 35	Silty clay loam	CL	A-7-6
	35 to 60	Silt loam	CL or ML	A-6 or A-4
Sharon (72).	0 to 60	Silt loam	ML	A-4
Stookey (216E, 216F, 216F3, 216G, 990F, 990G). For Bodine part of units 990F and 990G, see Bodine series.	0 to 60	Silt loam	ML or CL	A-4 or A-6
Stoy (164A, 164B).	0 to 12	Silt loam	CL-ML	A-4 or A-6
	12 to 36	Silty clay loam	CL	A-7 or A-6
	36 to 60	Silt loam	CL or ML	A-6 or A-4
Tice (284A, 284B, 284+).	0 to 60	Silty clay loam to silty clay	CL or CH	A-6 or A-7
Wakeland (333).	0 to 60	Silt loam	ML	A-4
Ware (456A, 456B).	0 to 20	Silt loam	ML	A-4
	20 to 60	Fine sandy loam	SM or ML	A-2 or A-4
Weinbach (461A, 461B).	0 to 16	Silt loam	ML-CL	A-4
	16 to 40	Silty clay loam	CL	A-7 or A-6
	40 to 60	Stratified layers of loam to silty clay loam.	ML or CL	A-4 or A-6
Weir (165).	0 to 16	Silt loam	CL-ML	A-6
	16 to 40	Silty clay loam or silty clay	CL or CH	A-7
	40 to 60	Silt loam	CL or ML	A-6 or A-4
Wheeling (463A, 463B, 463C2, 463E3).	0 to 10	Silt loam	ML	A-4
	10 to 40	Silty clay loam or clay loam	CL	A-6
	40 to 60	Stratified layers of silt loam to fine sandy loam.	ML or SN	A-4 or A-2

[1] Permeability classes of inches per hour are as follows: Less than 0.06 very slow; 0.06 to 0.20 slow; 0.20 to 0.63 moderately slow; 0.63 to 2.0 moderate; 2.0 to 6.3 moderately rapid; more than 6.3 rapid.

chemical properties of soils—Continued

Percent passing sieve— No. 4 (4.7 mm.)	No. 10 (2.0 mm.)	No. 200 (0.074 mm.)	Permeability [1]	Available water capacity	Reaction	Shrink-swell potential	Corrosion potential for metal conduits
			Inches per hour	*Inches per inch of soil*	*pH*		
100	100	85 to 100	0.20 to 0.63	0.18	5.1 to 6.0	Low to moderate	High.
100	100	85 to 100	0.06 to 0.2	0.16 to 0.19	5.1 to 6.0	Moderate to high	High.
100	100	85 to 100	0.20 to 0.63	0.19	5.1 to 6.0	Moderate	High.
100	100	95 to 100	0.63 to 2.0	0.21	6.6 to 7.3	Moderate	(2).
100	100	15 to 45	2.00 to >6.3	0.08	6.6 to 8.4	Low	Moderate.
100	100	25 to 60	2.00 to 6.3	0.14	5.6 to 6.0	Low	(2).
100	100	30 to 85	0.63 to 2.0	0.18	5.1 to 5.5	Low to moderate	High.
100	100	15 to 55	>6.3	0.08	5.1 to 5.5	Low	Moderate.
100	100	25 to 60	2.00 to 6.3	0.14	5.1 to 5.5	Low	(2).
100	100	55 to 85	0.06 to 0.2	0.19	4.5 to 5.0	Moderate	High.
100	(3)	(3)	(3)	(3)	5.1 to 6.0	Low to moderate	High.
100	100	15 to 45	>6.3	0.06 to 0.08	7.4 to 8.4	Low	Low.
100	100	75 to 90	0.63 to 2.0	0.20	5.1 to 6.0	Low	(2).
100	100	90 to 100	0.20 to 0.63	0.20	4.5 to 5.5	Moderate	High.
100	100	55 to 90	0.20 to 2.0	0.18	4.5 to 5.5	Moderate	High.
100	100	75 to 100	0.63 to 2.0	0.19	5.1 to 6.0	Low	Moderate.
100	100	70 to 100	0.63 to 2.0	0.19	5.1 to 6.0	Low	Low.
100	100	95 to 100	0.20 to 0.63	0.19	5.1 to 6.0	Low	(2).
100	100	95 to 100	0.06 to 0.2	0.18	5.1 to 6.0	Moderate to high	High.
100	100	95 to 100	0.20 to 0.63	0.19	5.1 to 6.0	Moderate	High.
100	100	90 to 100	0.20 to 2.00	0.20	6.6 to 7.3	Moderate to high	High.
100	100	85 to 100	0.20 to 0.63	0.18	6.1 to 7.3	Low	Moderate.
100	100	80 to 100	0.63 to 2.0	0.20	6.6 to 7.3	Low	(2).
100	100	25 to 60	2.00 to 6.3	0.12	6.6 to 7.8	Low	Moderate.
100	100	90 to 100	0.20 to 0.63	0.19	5.6 to 6.0	Low	(2).
100	100	90 to 100	0.06 to 0.2	0.19	4.5 to 5.5	Moderate	High.
100	100	75 to 100	0.2 to 2.00	0.16 to 0.20	4.5 to 5.5	Low to moderate	High.
100	100	95 to 100	0.63 to 2.0	0.19	5.1 to 6.0	Low	(2).
100	100	95 to 100	<0.06	0.16	4.5 to 5.5	Moderate to high	High.
100	100	95 to 100	0.20 to 0.63	0.18	4.5 to 6.0	Moderate	High.
100	100	85 to 100	0.63 to 2.0	0.19	5.1 to 6.0	Low	(2).
100	100	75 to 100	0.63 to 2.0	0.19	4.5 to 5.5	Moderate	Moderate.
100	100	30 to 70	0.63 to 6.3	0.19 to 0.12	4.5 to 5.5	Low	Low.

[2] Corrosion potential is estimated only for the horizons in which conduits would likely be buried.
[3] Variable.

TABLE 7.—*Interpretations of*

Soil and map symbols	Suitability as a source of—			Soil features affecting suitability for—	
	Topsoil	Sand or gravel	Highway subgrade material	Highway location	Farm ponds: Reservoir area
Alford (308B, 308C, 308C2, 308D, 308D2, 308D3, 308E2, 308E3, 308F, 308F2, 308F3).	Good in surface layer, unless severely eroded.	Not suitable	Poor or fair in subsoil; poor in substratum.	Deep loess; unstable when wet; moderate susceptibility to frost heaving; cuts and fills frequently needed; slopes moderately erodible.	Moderate seepage because of underlying porous material.
Allison (306)	Fair to depth of about 30 inches.	Not suitable	Poor	Subject to overflow where not protected by levees; moderate susceptibility to frost heaving.	On bottom lands; not ordinarily used for farm ponds.
Alluvial land (455)	Variable	Variable	Variable	Variable	Variable; not ordinarily used for farm ponds.
Alvin (131A, 131B, 131C, 131C2, 131D2, V131).	Fair in surface layer; somewhat sandy.	Good as source of sand below depth of 3 to 4 feet; generally poorly graded; stratified layers contain fines.	Fair or poor in subsoil; fair or good in substratum.	Exposed sand highly erodible; moderate susceptibility to frost heaving in upper 2 to 3 feet.	Underlain by sand below depth of 3 to 4 feet; excessive seepage.
Beaucoup (70, 70+)	Fair to a depth of about 1 foot, except in silty clay overwash.	Not suitable	Poor	Seasonal high water table; subject to flooding unless protected; high susceptibility to frost heaving; plastic soil material.	On bottom lands; not ordinarily used for farm ponds.
Belknap (382)	Good to depth of about 12 inches.	Not suitable	Poor or fair	Seasonal high water table; subject to flooding unless protected; high susceptibility to frost heaving.	On bottom lands; moderate seepage.
Birds (334)	Fair or poor in surface layer.	Not suitable	Poor or fair	Seasonal high water table; subject to flooding; medium or high susceptibility to frost heaving.	On bottom lands; seepage a problem.

engineering properties of soils

Soil features affecting suitability for—Continued					Degree of limitation for use as filter fields for septic-tank systems
Farm ponds—Con.: Embankments	Agricultural drainage	Irrigation	Terraces and diversions	Grassed waterways	
Poor stability; poor resistance to piping.	Not needed; natural drainage adequate.	High water-holding capacity; medium or slow intake rate; many areas sloping; other characteristics favorable.	No major construction difficulties, if topography is favorable.	No major construction problems; difficult to establish vegetation on channel slopes over 7 percent.	Slight on slopes of 2 to 4 percent; moderate on slopes of 4 to 12 percent; severe on slopes of 12 to 30 percent; moderate permeability.
Fair stability and compaction characteristics.	Not needed where protected by levees; unprotected areas subject to flooding.	High water-holding capacity; medium intake rate.	Not needed, because of topography.	Seldom used; no construction problems.	Severe; subject to flooding unless protected by levees.
Variable	Frequent flooding from rivers.	Variable; subject to frequent flooding.	Not needed, because of topography.	Not needed, because of topography.	Severe; seasonal high water table; subject to flooding.
Fair or good stability and compaction characteristics in subsoil; rapid permeability in substratum; poor resistance to piping.	Not needed; natural drainage adequate.	Moderate to low water-holding capacity; rapid intake rate; sand below depth of 3 to 4 feet.	Sandy substratum highly erodible if exposed; difficult to vegetate.	Sandy substratum highly erodible if exposed; difficult to vegetate.	Slight on slopes of 0 to 4 percent; moderate on slopes of 4 to 12 percent; nearby water supplies may be contaminated because of rapid permeability of underlying sand.
Fair stability; medium or high compressibility; fair or poor compaction characteristics; good resistance to piping.	Moderately slow permeability; subject to flooding unless protected; tile and open ditches needed for drainage.	High water-holding capacity; medium or slow intake rate; subject to flooding unless protected; other characteristics favorable.	Not needed, because of topography.	Not needed, because of topography.	Severe; seasonal high water table; subject to flooding.
Poor stability; poor compaction characteristics; poor resistance to piping.	Moderately slow permeability; subject to flooding unless protected; tile and open ditches needed for drainage.	High water-holding capacity; medium or slow intake rate; subject to flooding unless protected; other characteristics favorable.	Terraces not needed, because of topography; diversions may be needed at base of adjacent higher areas.	No major construction problems.	Severe; seasonal high water table; subject to flooding unless protected; moderately slow permeability.
Poor compaction characteristics; poor stability; low resistance to piping.	Slow permeability; subject to flooding unless protected; best suited to open drainage ditches.	High water-holding capacity; slow intake rate; slow permeability; subject to flooding.	Not needed, because of topography.	Not needed, because of topography.	Severe; seasonal high water table; subject to flooding; slow permeability.

TABLE 7.—*Interpretations of*

Soil and map symbols	Suitability as a source of— Topsoil	Sand or gravel	Highway subgrade material	Soil features affecting suitability for— Highway location	Farm ponds: Reservoir area
Bloomfield (53B)	Poor; sandy; low in organic-matter content; low water-holding capacity.	Good or fair as source of sand; generally poorly graded; bands of finer textured material below depth of 40 inches.	Fair or good	Sandy material; highly erodible.	Underlain by sand; excessive seepage.
Bodine (471G)	Poor; generally too cherty.	Poor as source of sand or gravel; good as source of silica.	Poor; shallow to rock; chert material sometimes used for surfacing secondary roads.	Shallow to rock; very steep slopes.	Shallow to fractured bedrock; difficult to excavate.
Bonnie (108, 108+, W108)	Fair or poor in surface layer.	Not suitable	Poor or fair	Seasonal high water table; subject to flooding; medium or high susceptibility to frost heaving.	On bottom lands; slight seepage.
Bowdre (589A, 589B)	Poor	Suitable as source of fine sand or loamy fine sand below depth of 2 feet.	Poor or fair	Seasonal high water table; subject to flooding unless protected by levees; highly susceptible to frost heaving; surface layer highly plastic.	Excessive seepage; seasonal high water table.
Cairo (590A, 590B, W590)	Poor	Fair or good as source of poorly graded sand below depth of 3 or 4 feet; stratified layers contain silty fines.	Variable; fair or poor.	Plastic clay; moderate susceptibility to frost heaving in upper 3 to 4 feet; exposed sand highly erodible; subject to overflow unless protected.	Excessive seepage through underlying sand.
Cape (422, 422+, W422) (For Karnak part of these units, see Karnak series).	Poor	Not suitable	Poor	Plastic clay; poor stability; high susceptibility to frost heaving; seasonal high water table; subject to flooding.	Seasonal high water table; subject to flooding; difficult to excavate.

engineering properties of soils—Continued

Soil features affecting suitability for—Continued					Degree of limitation for use as filter fields for septic-tank systems
Farm ponds—Con. Embankments	Agricultural drainage	Irrigation	Terraces and diversions	Grassed waterways	
Rapid permeability; low resistance to piping.	Not needed; natural drainage adequate.	Very low water-holding capacity; rapid intake rate.	Not suitable; deep sand.	Deep sand, highly erodible; difficult to vegetate.	Slight; nearby water supplies may be contaminated because of rapid permeability.
Too shallow and cherty for use as fill material.	Not needed; natural drainage adequate.	Not suitable, because of slopes and shallowness.	Not suitable, because of slopes and shallowness.	Difficult to establish vegetation, because of shallow soil and steep slopes.	Severe; shallow to rock; local water supplies may be contaminated.
Poor stability; poor or fair compaction characteristics; low resistance to piping.	Slow permeability; drainage needed; open ditches best suited; subject to flooding if not protected.	High water-holding capacity; slow intake rate; slow permeability; subject to flooding.	Not needed, because of topography.	Seldom used; no particular construction problems.	Severe; seasonal high water table; subject to flooding; slow permeability.
Poor or fair compaction characteristics; fair stability; low resistance to piping; rapid permeability below depth of 2 feet.	Slow permeability in upper layer; surface drainage needed; open ditches generally adequate; subject to flooding unless protected.	Moderate water-holding capacity in upper 2 feet; slow intake rate; subject to flooding unless protected.	Not needed, because of topography.	Seldom used; exposed sand highly erodible.	Severe; slow permeability in uppermost 2 feet; seasonal high water table; local water supplies may be contaminated because of excessive seepage.
Plastic clay in upper 3 or 4 feet has fair stability, fair or good compaction characteristics, and good resistance to piping; substratum has rapid permeability, poor resistance to piping.	Slow permeability in upper layer; drainage needed; open ditches best suited; subject to flooding unless protected.	Slow intake rate; moderate water-holding capacity.	Not needed	Not needed	Severe; very slow permeability in uppermost 3 to 4 feet; subject to flooding unless protected.
Poor stability; high susceptibility to frost heaving; high shrink-swell potential; difficult to excavate and compact; suitable for impervious cores and blanket material.	Very slow permeability; drainage needed; open ditches best suited; subject to flooding if not protected.	Slow intake rate; high water-holding capacity; very slow permeability; subject to overflow.	Not needed	Not needed	Severe; seasonal high water table; subject to flooding; very slow permeability.

TABLE 7.—*Interpretations of*

Soil and map symbols	Suitability as a source of— Topsoil	Suitability as a source of— Sand or gravel	Suitability as a source of— Highway subgrade material	Soil features affecting suitability for— Highway location	Soil features affecting suitability for— Farm ponds: Reservoir area
Darwin:					
Silty clay (71A, 71C, W71).	Poor	Not suitable	Poor; highly plastic.	Seasonal high water table; poor stability; compaction difficult; high shrink-swell potential; subject to flooding; highly plastic; hard to excavate.	Seasonal high water table; plastic material; difficult to excavate.
Silty clay loam (525)	Fair in surface layer.	Not suitable	Poor	Seasonal high water table; poor stability; compaction difficult; high shrink-swell potential; subject to flooding; highly plastic; difficult to excavate.	Seasonal high water table; plastic material; difficult to excavate.
Disco (266)	Good	Good as source of sand containing some fines below depth of 30 inches.	Fair or good	Moderate hazard of frost heaving.	Excessive seepage; underlain by sand below depth of 3 feet.
Drury (75D)	Good in surface layer.	Not suitable	Fair or poor	High susceptibility to frost heaving; poor stability.	Moderate seepage
Dupo (180)	Good in surface layer.	Not suitable	Poor or fair	High susceptibility to frost heaving; poor stability; seasonal high water table; subject to flooding where not protected.	Seasonal high water table; highly plastic material below surface layer; difficult to excavate.
Elsah (475)	Good in surface layer.	Not suitable	Poor; cherty material is sometimes used for surfacing secondary roads.	Uppermost 24 inches susceptible to frost heaving; chert below depth of 24 inches; subject to flash floods.	Shallow to cherty material.
Ginat (460)	Fair; low in organic-matter content.	Not suitable	Poor	High susceptibility to frost heaving; plastic clay below depth of 18 inches.	Seasonal high water table.

engineering properties of soils—Continued

Soil features affecting suitability for—Continued						Degree of limitation for use as filter fields for septic-tank systems
Farm ponds—Con. Embankments	Agricultural drainage	Irrigation	Terraces and diversions	Grassed waterways		
Poor stability; difficult to compact; high shrink-swell potential; suitable for impervious core material in zoned fills; plastic material difficult to excavate.	Slow permeability; drainage needed; open ditches best suited; subject to flooding if not protected.	High water-holding capacity; slow intake rate; slow permeability; needs drainage and protection from flooding.	Not needed, because of topography.	Seldom used; construction difficult because of high plasticity of soil.		Severe; seasonal high water table; subject to flooding; slow permeability.
Poor stability; difficult to compact; high shrink-swell potential; suitable for impervious core material in zoned fills; plastic material difficult to excavate.	Slow permeability; drainage needed; open ditches best suited; subject to flooding if not protected.	High water-holding capacity; moderately slow intake rate; slow permeability; needs drainage and protection from flooding.	Not needed, because of topography.	Seldom used; construction difficult because of high plasticity of soil.		Severe; seasonal high water table; subject to flooding; slow permeability.
Fair stability; fair or good compaction characteristics; poor resistance to piping.	Not needed; natural drainage adequate.	Moderately low water-holding capacity; medium intake rate; rapid permeability below depth of 30 inches.	Not needed, because of topography.	Seldom used; sandy material is highly erodible and difficult to vegetate.		Slight; nearby water supplies may be contaminated because of excessive seepage.
Poor or fair stability; poor or fair compaction characteristics; poor resistance to piping.	Not needed; natural drainage adequate.	High water-holding capacity; moderate intake rate.	No major construction problems if topography is suitable.	No major construction problems; vegetation may be difficult to establish on steep slopes.		Moderate; moderate permeability, but slopes are moderately steep.
Poor or fair stability; difficult to compact; fair or good resistance to piping; suitable for core material in zoned fill.	Moderately slow permeability; drainage and protection from flooding needed; drainage ditches best suited.	High water-holding capacity; medium intake rate; moderately slow permeability below depth of 2 feet.	Not needed, because of topography.	Seldom used; no major construction problems.		Severe; seasonal high water table; subject to flooding; moderately slow permeability.
Fair or poor stability; poor compaction characteristics; poor resistance to piping.	Not needed; natural drainage adequate.	Moderate intake rate; low water-holding capacity below depth of 24 inches.	No major construction problems.	Difficult to establish vegetation, because of droughtiness of shallow soil.		Moderate; nearby water supplies may be contaminated because of permeability of cherty material; subject to flash floods.
Fair or good stability, but seldom used because of topography.	Slow permeability; drainage ditches best suited.	Slow intake rate; slow permeability; high water-holding capacity.	Not needed, because of topography.	Seldom needed; no major construction problems.		Severe; slow permeability; seasonal high water table.

TABLE 7.—*Interpretations of*

Soil and map symbols	Suitability as a source of—			Soil features affecting suitability for—	
	Topsoil	Sand or gravel	Highway subgrade material	Highway location	Farm ponds: Reservoir area
Gorham (162A, 162B)	Fair	Poor to fair as source of sand below depth of 30 to 50 inches.	Good or fair below depth of 30 to 50 inches; poor in upper 30 to 50 inches.	High susceptibility to frost heaving; poor stability in upper 38 inches; subject to flooding unless protected by levees.	Excessive seepage; underlain by sandy material at depth of 3 feet; seasonal high water table.
Harvard (344)	Good in surface layer; fair or poor below.	Not suitable	Fair or poor	High susceptibility to frost heaving; poor stability.	Underlying river sediments variable.
Haymond (331)	Good to depth of 2 feet; fair below 2 feet.	Not suitable	Poor or fair	Subject to occasional flooding; medium or high susceptibility to frost heaving.	Excessive seepage likely through underlying material.
Hosmer (214B, 214C, 214C2, 214C3, 214D2, 214D3, 214E2, 214E3, 214F2, 214F3).	Good or fair in surface layer, unless severely eroded.	Not suitable	Poor or fair	Slopes erodible; seepage in cuts, at upper part of fragipan; high susceptibility to frost heaving; lower horizons somewhat plastic; cuts and fills frequently needed.	Underlying material variable.
Hurst (338A, 338B)	Fair in surface layer; poor below.	Not suitable	Very poor	Highly plastic; high shrink-swell potential; difficult to excavate and compact; seasonal high water table.	Plastic material; difficult to excavate.
Jacob (85)	Poor	Not suitable	Very poor	Subject to flooding; high shrink-swell potential; highly plastic; difficult to excavate and compact; high water table.	On bottom lands; subject to flooding; not ordinarily used for farm ponds.
Karnak (426, W426)	Poor	Not suitable	Very poor	Subject to overflow; high shrink-swell potential; highly plastic; difficult to excavate and compact; high water table.	On bottom lands; subject to flooding; not ordinarily used for farm ponds.
Lamont (175A, 175B, 175C).	Fair	Good as source of sand below depth of 3½ feet; generally poorly graded or silty.	Variable	Moderate susceptibility to frost heaving; sand exposed in cuts highly erodible.	Seepage likely because of underlying sand.

engineering properties of soils—Continued

Soil features affecting suitability for—Continued					Degree of limitation for use as filter fields for septic-tank systems
Farm ponds—Con. Embankments	Agricultural drainage	Irrigation	Terraces and diversions	Grassed waterways	
Fair or poor stability; poor resistance to piping.	Drainage needed; surface ditches generally adequate; likely to be excessively drained if tile is used; subject to flooding unless protected.	Medium intake rate; high water-holding capacity in upper 3 feet; subject to flooding unless protected.	Not needed, because of topography.	Not needed, because of topography.	Severe; subject to flooding; seasonal high water table; nearby water supplies may be contaminated because of rapid permeability of underlying sand.
Poor or fair stability, but seldom used because of topography.	Generally not needed; natural drainage usually adequate; tile or ditches suitable if adequate outlets are available.	Medium intake rate; moderate permeability in root zone; high water-holding capacity.	Not needed	Not needed	Slight.
Poor stability; low resistance to piping.	Not needed; natural drainage adequate; protection from flooding needed.	Medium intake rate; high water-holding capacity; subject to flooding.	Not needed	Seldom needed; no construction problems.	Moderate; subject to occasional flooding.
Poor stability; low resistance to piping.	Not needed; natural drainage adequate.	Shallow root zone; slow intake rate; moderate water-holding capacity in root zone.	Erodible; difficult to obtain good crop growth in deep cuts.	Erodible soil; vegetative cover difficult to establish in deep channels.	Severe; slow permeability in fragipan.
Poor stability; high shrink-swell potential; difficult to compact; suitable for impervious core or blanket material.	Very slow permeability; drainage needed; open ditches best suited.	Very slow permeability; medium intake rate; moderate water-holding capacity; needs drainage.	Not needed, because of topography.	Seldom used; construction difficult, because of high plasticity of soil.	Severe; very slow permeability.
Poor stability; high shrink-swell potential; difficult to excavate and compact; suitable for impervious core or blanket material.	Very slow permeability; drainage needed; open ditches best suited; subject to flooding if not protected; high water table.	Slow intake rate; moderate water-holding capacity; very slow permeability; subject to flooding; poor agricultural soil.	Not needed	Not needed	Severe; very slow permeability; subject to flooding; high water table.
Poor stability; high shrink-swell potential; difficult to excavate and compact; suitable for impervious core or blanket material.	Very slow permeability; drainage needed; open ditches best suited; subject to flooding if not protected; high water table.	Slow intake rate; moderate water-holding capacity; very slow permeability; subject to flooding.	Not needed	Not needed	Severe; very slow permeability; subject to flooding; high water table.
Sandy material; high seepage rate; low resistance to piping.	Not needed; natural drainage adequate.	Rapid intake rate; low or moderate water-holding capacity.	Not needed	Not needed	Slight; nearby water supplies may be contaminated because of permeability of sand layer.

TABLE 7.—*Interpretations of*

Soil and map symbols	Suitability as a source of—			Soil features affecting suitability for—	
	Topsoil	Sand or gravel	Highway subgrade material	Highway location	Farm ponds: Reservoir area
Landes (304A, 304B)	Fair	Fair as source of sand; generally poorly graded or silty below depth of 20 inches.	Fair or poor, depending on amount of silty fines.	Moderate susceptibility to frost heaving; slopes of cuts erodible.	Rapid permeability
Markland (467C3)	Poor; eroded slopes; clayey material.	Poor	Poor	Moderate susceptibility to frost heaving; poor stability; plastic.	Good reservoir areas
Millbrook (219)	Good in surface layer.	Not suitable	Poor	High susceptibility to frost heaving; poor stability.	Underlain by variable stratified sandy and clayey materials; not ordinarily used for farm ponds.
Muren (453C, 453D2, 453D3, 453E2, 453E3, 453F3).	Good if not severely eroded.	Not suitable	Poor	Poor stability; high susceptibility to frost heaving; cuts and fills frequently needed; moderately erodible.	Seepage possible
Newart (161)	Good	Fair as source of sand below depth of 38 inches; generally poorly graded or silty.	Fair or poor, depending on amount of silty fines.	Moderate susceptibility to frost heaving; seasonal high water table; subject to flooding.	Subject to flooding; underlain by permeable sandy material.
Okaw:					
Silt loam (84)	Fair	Not suitable	Very poor	Highly plastic; difficult to excavate or compact; high shrink-swell potential; poor stability; seasonal high water table.	Seasonal high water table; highly plastic; difficult to excavate.
Silty clay loam (401)	Poor	Not suitable	Very poor	Highly plastic; difficult to excavate and compact; high shrink-swell potential; poor stability; seasonal high water table.	Seasonal high water table; highly plastic; difficult to excavate.

engineering properties of soils—Continued

Soil features affecting suitability for—Continued					Degree of limitation for use as filter fields for septic-tank systems
Farm ponds—Con. Embankments	Agricultural drainage	Irrigation	Terraces and diversions	Grassed waterways	
Sandy material; high seepage rate; low resistance to piping.	Not needed; natural drainage adequate.	Rapid intake rate; low water-holding capacity.	Normally not needed; terraces suitable if topography warrants.	Normally not needed.	Slight; nearby water supplies may be contaminated because of rapid permeability.
Plasticity variable, may be high in substratum.	Not needed; natural drainage adequate because of slope.	Not suitable because of slope, degree of erosion, and clayey material.	Not needed	Difficult to establish vegetation; eroded and clayey.	Severe; slow permeability.
Substratum variable; seldom used because of topography.	Moderately slow permeability; drainage needed; tile functions effectively if adequate outlets are available; seasonal high water table.	Medium intake rate; high water-holding capacity.	Not needed	Not needed	Severe; moderately slow permeability; seasonal high water table.
Poor stability; high susceptibility to frost heaving; low resistance to piping.	Not needed; natural drainage adequate.	High water-holding capacity; medium or slow intake rate, except for slopes; characteristics favorable.	No major construction problems, if topography is suitable.	No major construction problems; difficult to establish vegetation where slope exceeds about 7 percent.	Moderate on slopes of 2 to 12 percent; severe on slopes of 12 to 18 percent; moderate permeability.
Sandy material; high seepage rate; low resistance to piping.	Seasonal high water table; drainage may be needed; subject to flooding unless protected.	Medium intake rate; high water-holding capacity; subject to flooding unless protected.	Not needed	Not needed	Moderate; occasional flooding; seasonal high water table; nearby water supplies may be contaminated because of permeability of sand layer.
Poor stability; high shrink-swell potential; difficult to compact; suitable for impervious core or blanket material.	Very slow permeability; seasonal high water table; drainage needed; open ditches best suited.	Very slow intake rate; moderate water-holding capacity; poor agricultural soil.	Not needed	Not needed	Severe; seasonal high water table; very slow permeability.
Poor stability; high shrink-swell potential; difficult to compact; suitable for impervious core or blanket material.	Very slow permeability; seasonal high water table; drainage needed; open ditches best suited.	Very slow intake rate; moderate water-holding capacity; poor agricultural soil.	Not needed	Not needed	Severe; very slow permeability; seasonal high water table.

TABLE 7.—*Interpretations of*

Soil and map symbols	Suitability as a source of— Topsoil	Suitability as a source of— Sand or gravel	Suitability as a source of— Highway subgrade material	Soil features affecting suitability for— Highway location	Soil features affecting suitability for— Farm ponds: Reservoir area
Petrolia (288, W288)	Poor	Not suitable	Poor	Seasonal high water table; high susceptibility to frost heaving; poor stability; subject to flooding.	Seasonal high water table subject to flooding.
Piopolis (420, W420)	Poor	Not suitable	Poor	Seasonal high water table; subject to flooding; plastic; poor stability; high susceptibility to frost heaving.	Seasonal high water table; subject to flooding.
Racoon (109)	Fair	Not suitable	Poor	High susceptibility to frost heaving; plastic clayey subsoil; poor stability; seasonal high water table.	Seasonal high water table.
Riley (452A, 452B, 452C)	Fair	Fair source of sand below depth of 2 feet; stratified layers of poorly graded sand and layers of fines.	Good or fair below depth of about 2 feet.	Poor stability and high susceptibility to frost heaving to depth of about 2 feet; fair or good material below this depth; sand exposed in cuts highly erodible; may be subject to flooding.	Rapid permeability in underlying sand.
Roby (184A, 184B)	Fair	Fair or good as source of sand; generally poorly graded below depth of 3½ feet; stratified layers contain silty and clayey fines.	Fair or poor in subsoil; fair or good in substratum.	Poor or fair stability; moderate or high susceptibility to frost heaving; seasonal high water table.	Excessive seepage through underlying sand; seasonal high water table.
Ruark (178)	Poor	Not suitable	Fair or poor in subsoil; variable in substratum; stratified layers of sandy and clayey materials.	Seasonal high water table; subsoil has high susceptibility to frost heaving.	Excessive seepage through underlying stratified materials; seasonal high water table.

engineering properties of soils—Continued

Soil features affecting suitability for—Continued					Degree of limitation for use as filter fields for septic-tank systems
Farm ponds—Con. Embankments	Agricultural drainage	Irrigation	Terraces and diversions	Grassed waterways	
Fair stability; medium or high compressibility; fair or poor compaction characteristics; good resistance to piping.	Moderately slow permeability; drainage needed; tile drainage fairly effective if adequate outlets are available; subject to flooding.	High water-holding capacity; medium or slow intake rate; subject to flooding.	Not needed	Not needed	Severe; seasonal high water table; subject to flooding; moderately slow permeability.
Fair stability; medium or high compressibility; fair or poor compaction characteristics; good resistance to piping.	Slow permeability; seasonal high water table; drainage needed; open ditches best suited; subject to flooding.	Slow intake rate; high water-holding capacity; slow permeability; drainage and protection from flooding needed.	Not needed	Not needed	Severe; seasonal high water table; subject to flooding; slow permeability.
Fair or good stability, but seldom used because of topography.	Slow permeability; seasonal high water table; drainage needed; open ditches best suited.	Medium intake rate; slow permeability; high water-holding capacity; drainage needed.	Not needed	Not needed	Severe; slow permeability; seasonal high water table.
Fair stability and compaction characteristics; sand has poor resistance to piping.	Not needed; natural drainage adequate to excessive; may be droughty where surface layer is relatively shallow; some areas subject to flooding unless protected.	Medium intake rate; water-holding capacity varies with thickness of surface layer; some areas subject to flooding.	Not needed	Not needed	Severe; subject to flooding; nearby water supplies may be contaminated because of rapid permeability of sandy material.
Subsoil has fair or good stability, fair or good compaction characteristics, and good resistance to piping; substratum has variable stability and compaction characteristics, poor resistance to piping.	Generally not needed; natural drainage usually adequate; seasonal high water table in level areas; tile or open ditches can be used but loose sand substratum should not be tapped.	Medium intake rate; moderate water-holding capacity; loose sand below depth of about 3½ feet; seasonal high water table in level areas.	Not needed	Not needed	Moderate; seasonal high water table; nearby water supplies may be contaminated by seepage through sand layers.
Subsoil has fair or good stability and good resistance to piping; variable material below depth of 40 inches.	Seasonal high water table; slow permeability; drainage generally needed; open ditches best suited.	Medium intake rate; moderate water-holding capacity; drainage generally needed.	Not needed	Not needed	Severe; seasonal high water table; slow permeability.

TABLE 7.—*Interpretations of*

Soil and map symbols	Suitability as a source of—			Soil features affecting suitability for—	
	Topsoil	Sand or gravel	Highway subgrade material	Highway location	Farm ponds: Reservoir area
Sarpy (92)	Very poor	Good as source of fine sand; generally poorly graded.	Fair or poor	Subject to flooding unless protected by levees; loose sand.	Rapid permeability; subject to flooding.
Sciotoville (462A, 462B, 462C2, 462C3, 462D2, 462D3).	Good	Not suitable	Poor	Poor stability; moderate susceptibility to frost heaving.	High seepage rate likely in underlying stratified materials.
Sharon (72)	Good	Not suitable	Poor	Poor stability; high susceptibility to frost heaving; subject to flooding.	Moderate or high seepage rate in underlying porous material; subject to flooding.
Stookey (216E, 216F, 216F3, 216G, 990F, 990G). (For Bodine part of these units, see Bodine series).	Good	Not suitable	Poor	Deep loess, unstable when wet; high susceptibility to frost heaving; cuts and fills frequently needed; slopes moderately erodible.	Steep slopes; underlain by porous material.
Stoy (164A, 164B)	Good	Not suitable	Fair or poor	Seasonal high water table in level areas; slopes generally seepy; poor or fair stability; high susceptibility to frost heaving.	Seasonal high water table.
Tice (284A, 284B, 284+)	Fair to depth of about 2½ feet for Tice silty clay loam; poor for Tice silty clay, overwash.	Not suitable	Poor	Plastic clay; poor stability; high susceptibility to frost heaving; subject to flooding unless protected; seasonal high water table.	Seasonal high water table on bottom lands.
Wakeland (333)	Good	Not suitable	Poor or fair	Seasonal high water table; subject to occasional flooding; high susceptibility to frost heaving.	Subject to occasional flooding; on bottom lands.
Ware (456A, 456B)	Good in surface layer.	Fair or good as source of poorly graded sand below depth of 2½ feet; stratified layers contain silty fines.	Variable; good to poor.	Subject to flooding unless protected by levees; exposed sand highly erodible.	Excessive seepage through underlying sand.

engineering properties of soils—Continued

Soil features affecting suitability for—Continued					Degree of limitation for use as filter fields for septic-tank systems
Farm ponds—Con. Embankments	Agricultural drainage	Irrigation	Terraces and diversions	Grassed waterways	
High seepage rate; low resistance to piping.	Not needed; excessive natural drainage.	Rapid intake rate; very low water-holding capacity.	Not needed	Not needed	Moderate; occasional flooding; nearby water supplies may be contaminated because of rapid permeability.
Fair or good stability and compaction characteristics; good resistance to piping.	Generally not needed; natural drainage usually adequate.	Medium intake rate; high water-holding capacity.	Short slopes; no major construction problems.	No major construction problems.	Severe; moderately slow permeability.
Poor stability; low resistance to piping.	Not needed; natural drainage adequate.	Subject to overflow; medium intake rate; high water-holding capacity.	Diversions may be needed along base of adjacent uplands; no construction problems.	Not needed	Severe; subject to flooding.
Poor stability and compaction characteristics; low resistance to piping.	Not needed; natural drainage adequate.	Not suitable because of steep slopes.	Steep slopes; not suitable.	No major construction problems, but difficult to establish vegetation in channels on these steep slopes.	Severe; steep slopes.
Poor stability; poor or fair resistance to piping.	Slow permeability; drainage needed in more nearly level areas; open ditches best suited.	Slow intake rate; high water-holding capacity; slow permeability.	No construction problems.	No construction problems.	Severe; slow permeability; seasonal high water table.
Fair stability and compaction characteristics; good resistance to piping.	Seasonal high water table; drainage needed; tile or open ditches can be used if adequate outlets are available; subject to flooding if not protected.	Medium intake rate; high water-holding capacity; drainage and protection from flooding needed.	Not needed	Not needed	Severe; seasonal high water table; subject to flooding; moderately slow to moderate permeability.
Poor stability; fair or poor compaction characteristics; poor resistance to piping.	Seasonal high water table; drainage needed; tile or open ditches suitable; subject to flooding if not protected.	Medium intake rate; high water-holding capacity; subject to flooding.	Diversions may be needed along base of adjacent uplands; no construction problems.	Not needed	Severe; moderately slow permeability; seasonal high water table; occasional flooding.
Fair stability and compaction characteristics; poor resistance to piping.	Not needed; natural drainage adequate; subject to flooding unless protected.	Medium intake rate; moderate to high water-holding capacity; subject to flooding unless protected by levees.	Not needed	Not needed	Severe if subject to flooding; slight if protected by levees; nearby water supplies may be contaminated by seepage through underlying sand.

TABLE 7.—*Interpretations of*

Soil and map symbols	Suitability as a source of—			Soil features affecting suitability for—	
	Topsoil	Sand or gravel	Highway subgrade material	Highway location	Farm ponds: Reservoir area
Weinbach (461A, 461B)	Fair	Not suitable	Poor or fair	Poor stability; high susceptibility to frost heaving; seasonal high water table.	Moderate seepage
Weir (165)	Fair in surface layer.	Not suitable	Poor	Plastic subsoil; high susceptibility to frost heaving; seasonal high water table.	Seasonal high water table.
Wheeling (463A, 463B, 463C2, 463E3).	Good in surface layer.	Not suitable	Poor in subsoil; fair or good in substratum.	Poor or fair; moderately plastic subsoil has moderate susceptibility to frost heaving; substratum has moderate susceptibility to frost heaving.	Excessive seepage likely in subsubstratum.

Sites for ponds must be selected with care. Table 7 indicates which soils are not suitable or are of doubtful quality. Slowly permeable soils are most suitable for the reservoir areas and generally can be used for embankments. The appraisals of suitability of soils for embankments are based on permeability, supporting strength, slope stability, and ease of compaction of the soil material.

Several soils that have a high content of plastic clay are considered suitable only for impervious cores or blankets. They are not suitable for homogeneous embankments. These soils are slowly permeable but are difficult to excavate and to compact. They have relatively low supporting strength and tend to flow out from under heavy loads unless they are well confined by more stable soil material. Soils that have a high silt content are suitable as embankment material only if special effort is made to obtain a high degree of compaction. Unless they are well compacted, these soils are likely to be porous, and water seeps through them in a relatively short time. As a result, the soil material on the downstream side of the embankment becomes wet and may slide out of place.

Piping is a major hazard in many silty and sandy soils. When there is a rapid rate of seepage through the embankment, the finer particles of soil material are washed out, leaving tunnellike holes that eventually may destroy the embankment.

Many of the soils on bottom lands and terraces need artificial drainage. Drainage is accomplished by installing tile drains or shallow surface ditches and by providing deep outlet ditches (fig. 18).

Tile drainage is not effective in all soils. Tiling generally is not suitable for heavy clay soils, through which water moves very slowly. Adequate outlets are essential in tile drainage. Bottom lands along the major rivers commonly lack good outlets.

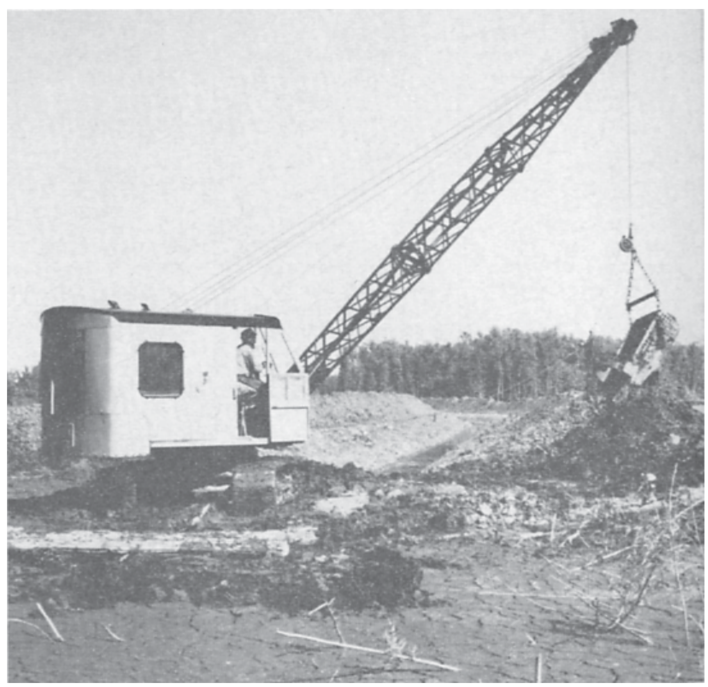

Figure 18.—**Drainage ditch 6 feet deep being installed in Darwin silty clay. Cracked soil in foreground is deposition from current year's flooding.**

engineering properties of soils—Continued

Soil features affecting suitability for—Continued					Degree of limitation for use as filter fields for septic-tank systems
Farm ponds—Con. Embankments	Agricultural drainage	Irrigation	Terraces and diversions	Grassed waterways	
Fair or poor stability and compaction characteristics.	Slow permeability; drainage generally needed in level areas; open ditches best suited.	Medium intake rate; high water-holding capacity.	No construction problems.	No construction problems.	Severe; slow permeability; seasonal high water table.
Poor or fair stability and compaction characteristics; poor resistance to piping.	Slow permeability; seasonal high water table; drainage needed; open ditches best suited.	Slow intake rate; high water-holding capacity; very slow permeability.	Not needed	Not needed	Severe; seasonal high water table; very slow permeability.
Subsoil has fair or good stability, fair or good compaction characteristics, and good resistance to piping; substratum has fair or poor stability, variable compaction characteristics, and poor resistance to piping.	Not needed; natural drainage adequate.	Medium intake rate; high water-holding capacity.	Seldom needed; no construction problems.	No construction problems.	Slight on slopes of 0 to 4 percent; moderate on slopes of 4 to 7 percent; severe on slopes of 12 to 18 percent; moderate permeability.

Shallow surface drainage ditches are suitable for draining level or nearly level soils. These drains consist of wide shallow channels (fig. 19) that can be crossed easily with farm machinery. They can be installed in combination with tile, or as a separate drainage system. In many locations, the efficiency of surface drains can be improved by land smoothing. Land smoothing consists of removing small ridges and high spots, and filling shallow low areas. This leaves a more uniform field slope and lets water move quickly into the drainage channels.

Deep outlet ditches generally receive water flowing from surface drainage channels, tile, and other outlet ditches. Generally, it is necessary to construct the ditch across two or more adjacent farms in order to reach an adequate outlet. The rapid growth of woody vegetation in outlet ditches necessitates regular maintenance to keep the ditches operating effectively. In planning and constructing outlet ditches it is necessary to determine bridge and culvert capacities and the need for structures to lower surface flow into the outlet ditch without causing erosion. Bank caving can be caused by underlying sand layers.

***Figure 19.*—Wide shallow waterway that has been mowed. Grass is ready to be put up for hay.**

Terraces and diversions help to control erosion on sloping soils. In many areas, however, terraces are not practical, because slopes are very steep or irregular. Diversions generally can be used if stabilized outlets are available.

Grassed waterways serve as outlets for diversions or terraces. They also help to prevent gullying in natural watercourses. The channels have to be properly shaped and should have a dense sod cover. Ordinarily, establishing vegetation in waterways is difficult if the soils are shallow or the slopes steep. A good mulch, liberal applications of fertilizer, and normal tillage are helpful.

Formation, Morphology, and Classification of Soils

This section discusses the factors that affect the formation, morphology, and classification of the soils of Pulaski and Alexander Counties and classifies the soils into higher categories. Following this discussion, each soil series in the two-county area is described, and a soil profile typical of that series is described.

TABLE 8.—*Engineering*

[Tests performed by Illinois Division of Highways, Bureau of Materials, Springfield, Ill., in accordance

Soil type and location of sample	Parent material	Report number	Depth	Horizon	Moisture-density data [1]	
					Maximum dry density	Optimum moisture
			In.		*Lb. per cu. ft.*	*Lb. per cu. ft.*
Darwin silty clay: SE¼SE¼ sec. 23, T. 14 S., R. 1 E.; 24 feet south and 38 feet east of south end of culvert at field entrance located on south end of road curve. (Modal)	Fine textured alluvium.	64–12718 64–12719	6 to 16 24 to 32	A1 B22g	101 104	20 21
Darwin silty clay: SW¼SW¼ sec. 21, T. 14 S., R. 3W.; in west bank of drainage ditch along west side of Illinois Highway 3 and 150 feet north of field. (Modal)	Fine textured alluvium.	64–12733 64–12734	6 to 14 20 to 40	A1 B–2g	107 109	31 30
Dupo silt loam: NW¼NE¼ sec. 23, T. 15 S., R. 1 W.; in east bank of deep ditch on east side of road and 35 feet south of REA brace pole. (Modal)	Alluvium.	64–12726 64–12727	11 to 21 39 to 50	C1 IIC4	104 110	15 18
Dupo silt loam: SW¼NE¼ sec. 32, T. 15 S., R. 1 W.; from field gate, 140 feet south along field lane to a pin oak tree, thence east 180 feet. (Modal)	Alluvium.	65–12731 65–12732	13 to 22 22 to 37	C2 IIA1bg	107 103	19 19
Newart silt loam: SE¼SW¼ sec. 9, T. 17 S., R. 2 W.; 200 feet north of first REA pole east of house. (Modal)	Alluvium.	64–12738 64–12739	7 to 9 44 to 58	A1 IIC2	111 102	16 18
Newart silt loam: SW¼SW¼ sec. 15, T. 17 S., R. 2 W.; 340 feet east of center of curve in road and 420 feet north of road. (Non-Modal)	Alluvium.	64–12740 64–12741	23 to 30 40 to 50	C2 IIC4	109 106	17 18
Sciotoville silt loam: NE¼NW¼ sec. 12, T. 14 S., R. 1 E.; 30 feet west of private road and 45 feet south of center of road. (Modal)	Loess or silty alluvium.	64–12720 64–12721 64–12722	0 to 8 24 to 40 47 to 56	Ap B22t C	109 104 116	17 21 15
Sciotoville silt loam: SE¼NW¼ sec. 10, T. 14 S., R. 1 E.; on west roadbank, 90 feet north of REA pole lead-in to house. (Modal)	Silty alluvium or loess.	64–12723 64–12724 64–12725	8 to 13 19 to 23 34 to 42	A2 B22t C	109 104 117	16 19 14
Stookey silt loam: NE¼NE¼ sec. 25, T. 15 S., R. 3 W.; 600 feet east of gravel road and 45 feet south of abandoned lane. (Modal)	Loess.	64–12735 64–12736 64–12737	3 to 9 19 to 30 30 to 50	A2 B22 C	110 113 112	18 16 17
Stoy silt loam: NW¼SE¼ sec. 7, T. 15 S., R. 2 E.; 200 feet west of house and 40 feet south of pecan tree. (Modal)	Loess.	64–12728 65–12729 65–12730	11 to 17 23 to 40 40 to 50	A2 B2t C	108 103 112	17 21 16

[1] Based on AASHO Designation: T 99–57, Method A (*1*).

[2] Mechanical analysis according to AASHO Designation: T 88–57 (*1*). Results by this procedure may differ somewhat from results obtained by the soil survey procedure of the Soil Conservation Service (SCS). In the AASHO procedure, the fine material is analyzed by the hydrometer method, and the various grain-size fractions are calculated on the basis of all the material, including that coarser than 2 millimeters in diameter. In the SCS soil survey procedure, the fine material is analyzed by the pipette method, and the material coarser

test data

with standard procedures of the American Association of State Highway Officials (AASHO) (*1*)]

Mechanical analysis [2]							Liquid Limit	Plasticity index	Classification	
Percentage passing sieve—			Percentage smaller than—						AASHO	Unified [3]
No. 10 (2.0 mm.)	No. 40 (0.42 mm.)	No. 200 (0.074 mm.)	0.05 mm.	0.02 mm.	0.005 mm.	0.002 mm.				
----------	----------	100	98	88	62	57	51	33	A-7-6(18)	CH.
----------	----------	100	99	97	80	72	56	37	A-7-6(19)	CH.
----------	100	99	98	96	92	90	81	51	A-7-6(20)	CH.
----------	100	99	98	95	88	84	80	54	A-7-6(20)	CH.
----------	100	99	85	45	17	14	25	1	A-4(8)	ML.
----------	100	99	94	71	39	35	38	20	A-6(12)	CL.
----------	----------	100	95	75	38	33	34	14	A-6(10)	CL.
----------	100	99	94	75	44	39	45	25	A-7-6(15)	CL.
----------	100	86	50	35	26	23	30	9	A-4(8)	CL.
----------	100	68	36	18	8	6	25	5	A-4(6)	CL-ML.
----------	100	80	65	38	19	13	27	3	A-4(8)	ML.
----------	100	86	74	30	14	10	28	3	A-4(8)	ML.
100	97	89	84	60	30	25	29	9	A-4(8)	CL.
100	99	97	96	81	55	50	46	24	A-7-6(15)	CL.
100	99	57	50	37	29	27	30	13	A-6(6)	CL.
100	99	78	71	65	25	19	26	5	A-4(8)	CL-ML.
100	97	90	87	78	59	55	44	23	A-7-6(14)	CL.
100	90	37	36	31	22	20	22	4	A-4(0)	SM-ML.
----------	100	99	95	58	28	25	30	10	A-6(8)	CL.
--------	----------	100	93	45	26	23	30	10	A-6(8)	CL.
----------	100	74	68	54	26	21	28	9	A-4(8)	CL.
100	95	94	86	64	26	21	25	6	A-4(8)	CL-ML.
----------	100	99	92	75	46	42	49	30	A-7-6(18)	CL.
----------	100	99	91	62	32	25	35	16	A-6(10)	CL.

than 2 millimeters in diameter is excluded from calculations of grain-size fractions. The mechanical analysis data used in this table are not suitable for naming textural classes for soils.

[3] SCS and BPR have agreed to consider that all soils having plasticity indexes within two points of A-line are to be given a borderline classification. Examples of borderline classifications obtained by this use are CL-ML and SM-ML.

Factors of Soil Formation

Soil is formed by weathering and other processes that act on parent material. The characteristics of the soil at any given point depend upon parent material, climate, living organisms, relief, and time.

Climate and living organisms are the active forces of soil formation. They act on the parent material accumulated through the weathering of rocks and slowly change it into soil. All five factors come into play in the formation of every soil. The relative importance of each differs from place to place; sometimes one is more important and sometimes another. In extreme cases one factor may dominate in the formation of a soil and fix most of its properties. In general, however, it is the combined action of the five factors that determines the present character of each soil.

Parent material

Parent material is derived mainly from the weathering of rock, but it may have been sorted and moved from place to place by glaciers, wind, and water. The soils of Pulaski and Alexander Counties formed mostly in alluvium or lakebed sediments, which are deposited by water, and in loess, which is deposited by wind. A few soils, such as the Bodine, have been strongly influenced by the underlying rock.

Most of the soils in this two-county area are on terraces and bottom lands. These soils developed mainly in old and recent alluvium that ranged from sand or loamy sand to silty clay or clay.

The soils on uplands formed mainly in loess, or windblown silt. The thickness of the loess on ridgetops and in level and nearly level areas ranges from more than 300 inches in the western and southern parts of Alexander County and in the southwestern part of Pulaski County to about 150 inches in the eastern part of Pulaski County. The large Pleistocene alluvial plain, which included the old Ohio River valley now occupied by the Cache River, is thought to be the main source of the loessal deposits in the two counties. In some places there are three layers of loess. In many places however, the lowest layer—the Loveland loess—is lacking because the soil that developed in this material was removed by erosion before new material was deposited. Where the Loveland loess does occur, it overlies bedrock residuum, bedrock, or Coastal Plain gravel. The second layer—the Farmdale or Roxana loess—generally makes up from a third to a half of the total thickness of the loess. The uppermost layer—the Peorian loess—ordinarily is the thickest and is the material in which the present soils developed.

The Bodine soils developed in thin deposits of loess over cherty material, which in some places is residuum weathered from cherty limestone but in most places is thick beds of relatively pure chert. In some places, soils associated with the Bodine soils developed in loess over Coastal Plain gravel.

On the uplands in Pulaski and Alexander Counties, there is a general relationship between the thickness of the loess and the degree of soil development. For example, the Stookey, Alford, and Muren soils formed, for the most part, in thicker deposits of loess than the more highly developed Weir, Stoy, and Hosmer soils. An exception may be the Hosmer soils on foot slopes and on the lower part of slopes in Alexander County. The higher degree of development of the Hosmer soils in these areas may be due to lateral seepage and the consequent higher moisture content rather than to the thickness of the loess. The formation of a fragipan in some of the loessal soils on uplands, particularly in the Hosmer soils, is thought to be related to the texture of the parent material, the stage of development, and the presence of a temporary or perched water table (*12*).

Climate and vegetation

Climate largely determines the rate of weathering, and it also influences the type of vegetation that grows on soils. The humid temperate climate of Pulaski and Alexander Counties is conducive to the relatively rapid breakdown of minerals, to the formation of clay, and to the translocation of these materials downward in the soil profile. It is also conducive to the growth of deciduous forest, which for a significant period prior to settlement covered all of the uplands and most of the terraces and bottom lands. As a result, most of the soils have a relatively light-colored surface horizon. The dark-colored Disco soils on terraces are the only soils in the two-county area that developed entirely under grass. Several dark-colored soils on bottom lands and the Millbrook and Harvard soils on terraces probably were influenced by grass to some extent and probably developed under mixed stands of grass and forest.

Relief

Under given climatic conditions and in uniform parent material, relief largely controls the amount of moisture in the soil. It influences the amount of runoff, the amount of infiltration, and the degree of erosion. In uniform materials, such as loess, differences in natural soil drainage generally are closely associated with slope, or relief.

On steep slopes, where runoff is very rapid, soils tend to be thin, and their horizons generally are weakly expressed. This is most likely to be the case where geologic erosion removes soil material almost as fast as it forms.

Time

The length of time necessary for a soil to develop depends on the other factors of soil formation. Soil development generally is faster in a humid climate that supports good vegetation than in a dry climate that supports little vegetation. Soils normally become more strongly developed with increased time of exposure to weathering processes. On slopes where geologic erosion is rapid, however, soils may be in the early stages of development, even though the slopes have been exposed to weathering for thousands of years.

Classification of Soils by Higher Categories

Classification consists of an orderly grouping of soils according to a system designed to make it easier to remember soil characteristics and interrelationships. Classification is also useful in organizing and applying the results of experience and research. Soils are placed in narrow classes for discussion in detailed soil surveys and for application of knowledge within farms and fields. The many thousands of narrow classes are then grouped in progressively fewer and broader classes, so that information can be applied to large geographic areas.

Two systems of classifying soils are used in the United States. The older of these systems was adopted in 1938 (*2*) and later revised and expanded (*25*). The other [9] has been in use since January 1965, though it is undergoing continual study.

In the older system the soil series are grouped on the basis of general similarity of profile characteristics into a higher category, the great soil group. Great soil groups are used to show relationships between soils in an area or between areas. In many cases soils do not fit exactly into one group but possess characteristics of two great soil groups. These soils are shown as intergrading from one great soil group to another.

[9] UNITED STATES DEPARTMENT OF AGRICULTURE. SOIL CLASSIFICATION, A COMPREHENSIVE SYSTEM. 7TH APPROXIMATION. Soil Surv. Staff, Soil Cons. Serv., 1960. [Supplement issued in March 1967]

The current system of soil classification consists of six categories. Beginning with the most inclusive, these categories are the order, the suborder, the great group, the subgroup, the family, and the series. The criteria for classification are soil properties that are measurable or observable, but the properties are selected so that soils of similar genesis are grouped together. Placement of some series in the current system of classification, particularly in families, may change as more precise information becomes available. Readers interested in the development of this system should search for the latest available literature (*24*).

In table 9 the soil series of Pulaski and Alexander Counties have been classified by subgroups according to the comprehensive soil classification system, and by great soil groups according to the 1938 system.

TABLE 9.—*Classification of soils*

Series	Current classification by subgroups	1938 classification by great soil groups
Alford	Typic Hapludalf	Gray-Brown Podzolic soils.
Allison	Fluventic Hapludoll	Brunizems intergrading toward Alluvial soils.
Alvin	Typic Hapludoll	Gray-Brown Podzolic soils.
Beaucoup	Fluventic Haplaquoll	Humic Gley soils.
Belknap	Aeric Fluventic Haplaquept	Alluvial soils.
Birds	Fluventic Haplaquept	Alluvial soils intergrading toward Low-Humic Gley soils.
Bloomfield	Psammentic Hapludalf	Gray-Brown Podzolic soils intergrading toward Regosols.
Bodine	Typic Dystrochrept	Regosols.
Bonnie	Fluventic Haplaquept	Alluvial soils intergrading toward Low-Humic Gley soils.
Bowdre	Aquic Fluventic Hapludoll	Humic Gley soils.
Cairo	Typic Haplaquoll	Humic Gley soils.
Cape	Fluventic Haplaquept	Alluvial soils intergrading toward Low-Humic Gley soils.
Darwin	Vertic Haplaquoll	Humic Gley soils.
Disco	Cumulic Hapludoll	Brunizems.
Drury	Dystric Eutrochrept	Gray-Brown Podzolic soils intergrading toward Alluvial soils.
Dupo	Aquic Udifluvent	Alluvial soils.
Elsah	Typic Udifluvent	Alluvial soils.
Ginat	Typic Fragiaqualf	Low-Humic Gley soils intergrading toward Planosols.
Gorham	Typic Haplaquoll	Humic Gley soils.
Harvard	Mollic Hapludalf	Gray-Brown Podzolic soils intergrading toward Brunizems.
Haymond	Typic Udifluvent	Alluvial soils.
Hosmer	Typic Fragiudalf	Gray-Brown Podzolic soils intergrading toward Red-Yellow Podzolic soils.
Hurst	Aeric Ochraqualf	Gray-Brown Podzolic soils.
Jacob	Vertic Haplaquept	Alluvial soils intergrading toward Low-Humic Gley soils.
Karnak	Vertic Haplaquept	Alluvial soils intergrading toward Low-Humic Gley soils.
Lamont	Typic Hapludalf	Gray-Brown Podzolic soils.
Landes	Fluventic Hapludoll	Alluvial soils.
Markland	Typic Hapludalf	Gray-Brown Podzolic soils.
Millbrook	Udollic Ochraqualf	Gray-Brown Podzolic soils intergrading toward Brunizems.
Muren	Aquic Hapludalf	Gray-Brown Podzolic soils.
Newart	Aquic Hapludoll	Brunizems intergrading toward Alluvial soils.
Okaw	Typic Albaqualf	Planosols.
Petrolia	Fluventic Haplaquept	Alluvial soils intergrading toward Low-Humic Gley soils.
Piopolis	Fluventic Haplaquept	Alluvial soils intergrading toward Low-Humic Gley soils.
Racoon	Typic Ochraqualf	Low-Humic Gley soils intergrading toward Planosols.
Riley	Aquic (Aquic Fluventic) Hapludoll	Brunizems intergrading toward Alluvial soils.
Roby	Aquic Hapludalf	Gray-Brown Podzolic soils.
Ruark	Typic Ochraqualf	Low-Humic Gley soils intergrading toward Planosols.
Sarpy	Fluventic Udipsamment	Alluvial soils.
Sciotoville	Typic Fragiudalf	Gray-Brown Podzolic soils intergrading toward Red-Yellow Podzolic soils.
Sharon	Typic Udifluvent	Alluvial soils.
Stookey	Typic Hapludalf	Gray-Brown Podzolic soils.
Stoy	Aquic Fragiudalf	Gray-Brown Podzolic soils.
Tice	Aquic Fluventic Hapludoll	Brunizems intergrading toward Alluvial soils.
Wakeland	Aquic Fuventic Haplaquept	Alluvial soils.
Ware	Typic (Fluventic) Hapludoll	Brunizems intergrading toward Alluvial soils.
Weinbach	Aeric Fragiaqualf	Gray-Brown Podzolic soils.
Weir	Typic Ochraqualf	Planosols.
Wheeling	Ultic Hapludalf	Gray-Brown Podzolic soils intergrading toward Red-Yellow Podzolic soils.

New soil series must be established and concepts of some established series, especially older ones that have been used little in recent years, must be revised in the course of the soil survey program across the country. A proposed new series has tentative status until review of the series concept at National, State, and regional levels of responsibility for soil classification results in a judgment that the new series should be established. Most of the soil series described in this publication had been established earlier. Three of the soil series used in this survey had tentative status when the survey was sent to the printer. They are the Cairo, Cape, and Ware series.

Detailed Descriptions of the Soil Series

The soil series represented in Pulaski and Alexander Counties are discussed in alphabetical order in the following pages. A profile typical of each series is described, and some of the major variations in the soils are noted. Unless otherwise stated, the colors described are those of moist soils.

Alford Series

The Alford series consists of well-drained soils that formed in loess along the east side of the Mississippi River valley. On ridgetops the loess is from 15 to 40 feet thick. On steep side slopes it is as little as 4 feet in thickness. The bedrock is principally massive chert beds that range to as much as 200 feet in thickness. In some small local areas limestone occurs below the loess, and near Fayville and Mounds there is Coastal Plain gravel below the loess. The native vegetation was a deciduous forest consisting mainly of oak, hickory, walnut, and tulip-poplar.

Representative profile of Alford silt loam, in a pasture, Alexander County, SE¼NW¼NE¼ sec. 29, T. 14 S., R. 2 W.; 410 feet east of large mulberry tree at old house site, 200 feet south of gully in bottom of draw.

Ap—0 to 5 inches, mixed dark grayish-brown (10YR 4/2) and brown (10YR 4/3) silt loam; moderate, thin, platy structure; friable; many roots; neutral; abrupt, smooth boundary.

B1—5 to 10 inches, brown (7.5YR 4/4) silt loam; weak to moderate, medium, subangular blocky structure; friable to firm; peds coated with thin pale-brown (10YR 6/3) silt; many roots and worm channels; slightly acid; clear, smooth boundary.

B21t—10 to 18 inches, brown (7.5YR 4/4) silty clay loam; strong, medium, subangular blocky structure; firm; peds coated with thin, continuous, brown (7.5YR 4/4) clay films and, when dry, with thin deposits of light-gray (10YR 7/1) silt that fades when moist; many roots; slightly acid; gradual, smooth boundary.

B22t—18 to 30 inches, brown (7.5YR 4/4) silty clay loam; strong, medium, subangular blocky structure; firm; peds coated with thick, continuous, brown (7.5YR 4/4) clay films and, when dry, with thin light-gray (10YR 7/1) deposits of silt that fades when moist; many roots; few very dark gray (10YR 3/1) iron-manganese concretions; medium acid; gradual, smooth boundary.

B23t—30 to 43 inches, brown (7.5YR 4/4) silty clay loam; strong, medium, subangular blocky structure; firm; peds coated with medium, continuous, brown (7.5YR 4/4) clay films and, when dry, with thin light-gray (10YR 7/1) deposits of silt that fades when moist; few iron-manganese concretions; strongly acid; clear, smooth boundary.

B31—43 to 55 inches, brown (7.5YR 4/4) light silty clay loam; moderate, medium, subangular blocky structure; firm; peds coated with thin, continuous, brown (7.5YR 4/4) clay films and, when dry, with thin, continuous, pale-brown (10YR 6/3) deposits of silt that fades when moist; strongly acid; clear, smooth boundary.

B32—55 to 68 inches, brown (10YR 4/3) heavy silt loam; weak, medium and coarse, subangular and angular blocky structure; friable; peds coated with thin brown (7.5YR 4/4) clay films and, when dry, with thin pale-brown (10YR 6/3) deposits of silt that fades when moist; very strongly acid; gradual, smooth boundary.

B33—68 to 82 inches, brown (10YR 4/3) to dark-brown (10YR 3/3) silt loam; few, coarse, faint mottles of pale brown (10YR 6/3); weak, coarse, subangular and angular blocky structure; friable; peds coated with thin brown (7.5YR 4/4) clay films; very strongly acid; gradual, smooth boundary.

C—82 to 92 inches +, brown (10YR 4/3) and dark yellowish-brown (10YR 4/4) silt loam; few, coarse, faint mottles of pale brown (10YR 6/3); coarse, blocky structure to massive; friable; very strongly acid at 92 inches, medium acid at 138 inches.

In many places, especially on the steeper slopes, the solum is less than 60 inches thick. The texture of the B horizon ranges from light silty clay loam to medium silty clay loam. Where the Alford soils grade to the Stookey soils, the structure of the B horizon is less well developed and the texture approaches silt loam.

Allison Series

The Allison series consists of well drained and moderately well drained, moderately dark colored soils that formed in silty clay loam sediments more than 50 inches thick. These soils are on level or nearly level bottom lands adjacent to the Ohio River. The native vegetation was a deciduous forest, consisting mainly of maple, pecan, oak, and cottonwood.

Representative profile of Allison silty clay loam, in a cultivated field, Alexander County, SE¼SE¼NE¼ sec. 2, T. 17 S., R. 1 W.; 55 feet east of base of levee berm, at access road from top of levee.

Ap—0 to 6 inches, dark-brown (10YR 3/3) silty clay loam; coarse, granular structure and some coarse, angular blocky structure; firm; neutral; abrupt, wavy boundary.

A1—6 to 13 inches, dark-brown (10YR 3/3) silty clay loam; few yellowish iron stains; granular structure; firm; mildly alkaline; clear, wavy boundary.

B21—13 to 27 inches, dark yellowish-brown (10YR 3/4) silty clay loam; few yellowish iron stains; moderate, medium, subangular blocky structure; firm; common worm channels; mildly alkaline; clear, wavy boundary.

B22—27 to 35 inches, dark yellowish-brown (10YR 4/4) silty clay loam; few, fine, faint mottles of light yellowish brown (10YR 6/4), and few, fine, distinct mottles of strong brown (7.5YR 5/6); moderate, medium and fine, subangular blocky structure; firm; brown (10YR 4/3) ped faces; mildly alkaline; gradual, wavy boundary.

B3—35 to 50 inches +, dark yellowish-brown (10YR 4/4) silty clay loam; few, fine, faint mottles of light yellowish brown (10YR 6/4), and few, fine, distinct mottles of strong brown (7.5YR 5/6); weak, fine and medium, subangular blocky structure; firm; few worm casts and channels; mildly alkaline.

The color of the surface layer normally is very dark grayish brown (10YR 3/2) but ranges to dark yellowish brown (10YR 3/4). The reaction ranges from moderately alkaline to slightly acid. In some areas mottles occur at a depth between 24 and 40 inches. Strata of textures other than silty clay loam are rare above a depth of 50 inches.

Alvin Series

The Alvin series consists of well drained or moderately well drained soils that formed in sandy materials derived

from Ohio River sediments. These soils are on level to moderately sloping terraces along the Cache River. The native vegetation was a deciduous forest, consisting mainly of oak, ash, tulip-poplar, sweetgum, and maple.

Representative profile of Alvin fine sandy loam, in a cultivated field, Alexander County, about 715 feet north and 250 feet west of the southeast corner of the SW¼ of sec. 35, T. 15 S., R. 2 W.

Ap—0 to 6 inches, fine sandy loam; brown (10YR 4/3) when moist, pale-brown (10YR 6/3) when dry; massive; very friable; strongly acid; abrupt, smooth boundary.

A21—6 to 11 inches, brown (10YR 4/3) fine sandy loam; slightly less clay than in above horizon; weak, thick, platy structure; many clean sand grains on ped surfaces; some brittleness when dry (probably a plowpan), very friable when moist; strongly or medium acid; gradual, smooth boundary.

A22—11 to 16 inches, dark yellowish-brown (10YR 4/4) fine sandy loam; weak, thick, platy structure; many clean sand grains on ped surfaces; very friable; strongly to medium acid; clear, smooth boundary.

B1—16 to 19 inches, brown (7.5YR 4/4) heavy sandy loam; weak, medium to fine, subangular blocky structure; friable; thin clay films; strongly or medium acid; clear, smooth boundary.

B21—19 to 26 inches, brown (7.5YR 4/4) heavy sandy loam; moderate, medium, subangular blocky structure; friable; clay films are continuous and are thicker with depth; medium or strongly acid; clear, smooth boundary.

B22—26 to 32 inches, brown (7.5YR 4/4) sandy loam; weak, coarse to medium, subangular blocky structure; very friable; discontinuous but large areas of thick dark-brown (7.5YR 3/2) clay films, primarily on vertical surfaces; strongly or medium acid; clear, smooth boundary.

B31—32 to 43 inches, brown (7.5YR 4/4) light sandy loam to heavy loamy sand; weak, coarse, subangular blocky structure; very friable; thick to thin, patchy, dark-brown (7.5YR 3/2 to 4/2) clay films on vertical faces; very strongly acid; gradual, smooth boundary.

B32—43 to 52 inches, dark yellowish-brown (10YR 4/4) light sandy loam to heavy loamy sand; weak, coarse, subangular blocky structure to massive with vertical cleavage faces; very friable; thick to thin, patchy, dark-brown (7.5YR 3/2 to 4/2) clay films on vertical faces; very strongly or extremely acid; clear, smooth boundary.

C—52 to 60 inches, dark yellowish-brown (10YR 4/4) to yellowish-brown (10YR 5/5) sand; single grain; loose; a lens of clay and iron, about 1½ inches thick; very strongly or extremely acid.

The thickness of the A horizon varies somewhat but is less than 24 inches. The B horizon is more than 10 inches thick and ordinarily is heavy sandy loam, light loam, light sandy clay loam, or a combination of these textures. In places the underlying material is fine sandy loam to fine sand or, in some places, stratified sandy and clayey materials. The reaction of the B horizon ranges from very strongly acid to slightly acid.

The chemical and physical properties of this profile are given in table 10, p. 116. Profile description of Alvin fine sandy loam, in a cultivated field, Alexander County, SW¼SW¼SE¼ sec. 35, T. 15 S., R. 2 W.

Ap—0 to 6 inches, dark-brown (10YR 4/3) fine sandy loam; fine crumb structure to structureless; neutral.

A2—6 to 13 inches, brown (10YR 4.5/3) fine to very fine sandy loam; breaks into ¼-inch, irregular, angular crumbs; neutral.

B1—13 to 19 inches, dark yellowish-brown (7.5YR-10YR 4/4) fine sandy clay loam; breaks into ¼-inch, irregular, angular fragments; slightly acid.

B21—19 to 24 inches, brown to reddish-brown (5YR-7.5YR 4/4) clay loam; breaks into ¾-inch to 1-inch, irregular, angular blocky aggregates; thinly coated with reddish brown (5YR 4/4); very strongly acid.

B22—24 to 30 inches, brown to dark-brown (7.5YR 4/4) clay loam; breaks into ¾-inch to 1-inch, irregular, angular blocky aggregates; thinly coated with yellowish-brown (10YR 3/4) silica flour; very strongly acid.

B23—30 to 35 inches, brown to dark-brown (7.5YR 4/4) clay loam; breaks into 1-inch to 1¼-inch, irregular, angular, vertical, elongated aggregates up to 3 inches in length; thinly coated with brown (10YR 5/4) silica flour; very strongly acid.

B24—35 to 41 inches, dark yellowish-brown (10YR 4/4) fine sandy clay loam; breaks into 1-inch to 2-inch, irregular, angular aggregates and fragments; extremely acid; (corn roots penetrate into this horizon).

C1—41 to 48 inches, dark yellowish-brown (10YR 4/4) loamy fine sand; single grain; very strongly acid.

C2—48 to 55 inches, dark-brown (7.5YR 3/4) fine sandy loam, very lightly cemented with iron; very slightly compact; hard when dry; very strongly acid.

Alvin Series, Thick A2 Horizon Variant

The Alvin series, thick A2 horizon variant, consists of well-drained soils that have a thick A2 horizon. These soils formed in sandy materials derived from Ohio River sediments. They are on level or nearly level terraces along the Cache River. The native vegetation was a deciduous forest, consisting mainly of oak, ash, tulip-poplar, sweetgum, and maple.

Representative profile of Alvin fine sandy loam, thick A2 horizon variant, in a cultivated field in Alexander County, NE¼NE¼SW¼ sec. 35, T. 15 S., R. 2 W.; 280 feet north of culvert in lane, and 30 feet west of field lane.

Ap—0 to 7 inches, brown (10YR 4/3) fine sandy loam; single grain; friable; mildly alkaline; abrupt, smooth boundary.

A1—7 to 10 inches, very dark grayish-brown (10YR 3/2) fine sandy loam; weak, thick, platy structure; compact (plow pan); friable; mildly alkaline; clear, smooth boundary.

A2—10 to 28 inches, dark-brown (7.5YR 4/4) fine sandy loam; brown (10YR 4/3) worm casts; very weak, thick, platy structure; friable; mildly alkaline; clear, wavy boundary.

B1—28 to 35 inches, brown (10YR 4/3) heavy loam; weak, fine, subangular blocky structure; firm; slightly acid; clear, wavy boundary.

B2t—35 to 50 inches, brown (10YR 4/3) sandy clay loam; weak, medium, subangular blocky structure; firm; slightly acid; clear, wavy boundary.

C1—50 to 57 inches, yellowish-brown (10YR 5/4) fine sandy loam; single grain; loose; strongly acid.

C2—57 to 64 inches, dark-brown (10YR 4/3) fine sandy loam; single grain; loose; strongly acid.

C3—64 to 72 inches, dark yellowish-brown (10YR 4/4) lenses of stratified sandy clay loam and fine sandy loam, 1 to 3 inches thick; strongly acid.

The A horizon ranges from 24 to 40 inches in thickness but ordinarily is about 30 inches thick. The B horizon is sandy clay loam or clay loam and is more than 10 inches thick. In places the substratum is stratified material that ranges from fine loamy sand to clay loam. The reaction of the B horizon ranges from strongly acid to slightly alkaline.

Beaucoup Series

The Beaucoup series consists of poorly drained or very poorly drained, moderately dark colored soils. These soils formed in silty clay loam sediments more than 40 inches thick. They are in gently sloping areas and depressions on bottom lands along the Mississippi River and in the Cache River basin. The native vegetation was a deciduous

forest, consisting mainly of sycamore, cottonwood, silver maple, pin oak, swamp white oak, and black walnut.

Representative profile of Beaucoup silty clay loam, in a cultivated field, Pulaski County, NW¼NE¼NE¼ sec. 24, T. 14 S., R. 2 E.; 60 feet south of State Route 169, and 200 feet east of gravel road.

Ap—0 to 6 inches, very dark grayish-brown (10YR 3/2) silty clay loam; strong, fine, subangular blocky structure; friable; slightly acid; clear, smooth boundary.

A1—6 to 13 inches, very dark gray (10YR 3/1) silty clay loam; common, fine, distinct mottles of yellowish brown (10YR 5/4); strong, fine and medium, subangular blocky structure; firm; slightly acid; clear, smooth boundary.

Bg—13 to 35 inches, grayish-brown (2.5Y 5/2) silty clay loam; common, fine, distinct mottles of yellowish brown (10YR 5/6); weak, medium, subangular blocky structure; firm; slightly acid; gradual, smooth boundary.

Cg—35 to 50 inches, grayish-brown (2.5Y 5/2) silty clay loam; common, fine, distinct mottles of yellowish brown (10YR 5/6); massive; firm; slightly acid.

The dark-colored surface horizon normally is 8 to 15 inches thick. Structure generally extends to a depth of 30 to 45 inches. In most areas the Beaucoup soils are underlain by thick deposits of silty clay loam to silty clay, but in some places there are thin sandy to silty lenses in the lower part of the profile.

Belknap Series

The Belknap series consists of somewhat poorly drained, light-colored soils that formed in acid silt loam sediments derived mainly from nearby loess-covered uplands. These soils occur as small or medium-sized bottom lands in Pulaski County and as large bottom lands along the Cache River. The native vegetation was a deciduous forest, consisting principally of oak, red gum, sycamore, and cottonwood.

Representative profile of Belknap silt loam, in an abandoned field, Pulaski County, SW¼SW¼NW¼ sec. 20, T. 15 S., R. 1 E.; on west bank of gully, 20 feet east and 10 feet north of field entrance on north side of road.

Ap—0 to 4 inches, brown (10YR 4/3) silt loam; weak, medium, granular structure; friable; strongly acid; abrupt, smooth boundary.

A1—4 to 12 inches, brown (10YR 4/3) silt loam; few, very fine, distinct mottles of dark yellowish brown (10YR 4/6); weak, thick, platy structure; friable; few fine pores; strongly acid; gradual, smooth boundary.

C1—12 to 29 inches, mixed dark grayish-brown (10YR 4/2) and pale-brown (10YR 6/3) silt loam; few, fine, distinct mottles of dark yellowish brown (10YR 4/6); massive; friable; few or common fine pores; few, fine, soft iron-manganese concretions; strongly acid; gradual, smooth boundary.

C2—29 to 57 inches, brown (10YR 5/3) silt loam; few, fine and medium, faint mottles of pale brown (10YR 6/3); massive; friable; common fine pores; few, fine, soft iron-manganese concretions; medium acid; gradual, wavy boundary.

C3—57 to 63 inches +, light brownish-gray (10YR 6/2) silt loam; common, fine, distinct mottles of yellowish brown (10YR 5/4), and many, fine and medium, black (10YR 2/1) iron-manganese stains; massive; friable; many, medium, soft iron-manganese concretions; medium acid.

The reaction commonly is medium acid but ranges to very strongly acid. In places, thin lenses of sand or sandy loam occur in the lower part of the profile.

Birds Series

The Birds series consists of poorly drained, light-colored soils that formed in slightly acid or neutral silt loam sediments derived mainly from the very thick deposits of loess on nearby uplands. These soils occur as medium or large bottom lands. The native vegetation was a deciduous forest, consisting principally of pin oak, swamp white oak, and cottonwood.

Representative profile of Birds silt loam, in a cultivated field, Alexander County, NE¼NE¼SE¼ sec. 9, T. 15 S., R. 3 W.; 100 feet south of field bridge across small stream, 115 feet west of fence.

Ap—0 to 7 inches, grayish-brown (10YR 5/2) silt loam; common, medium, faint mottles of light brownish gray (10YR 6/2); common, fine, distinct, dark yellowish-brown (10YR 4/4) iron stains; weak, fine, granular structure; friable; neutral; abrupt, smooth boundary.

Bg—7 to 22 inches, gray (10YR 6/1) silt loam; many, medium, distinct mottles of dark grayish brown (10YR 4/2), and common, fine, distinct mottles of strong brown (7.5YR 5/6); weak, fine, granular structure to massive; friable; fine iron-manganese concretions are common; neutral; abrupt, smooth boundary.

C1g—22 to 27 inches, very thinly stratified light-gray (10YR 7/2), dark-gray (10YR 4/1), and dark grayish-brown (10YR 4/2) silt loam; many, fine, distinct mottles of dark brown (7.5YR 4/4); massive; friable; numerous fine iron-manganese concretions; neutral; abrupt, smooth boundary.

C2g—27 to 52 inches +, light brownish-gray (10YR 6/2) silt loam; few, fine, distinct mottles of strong brown (7.5YR 5/6 and 5/8); common, fine and medium, prominent, dark reddish-brown (5YR 3/4) iron stains; massive; friable; fine iron-manganese concretions are common; neutral.

In some places the Ap horizon is free of mottles. The texture of the silt fraction tends to be coarse, and in places the texture is almost very fine sand.

Bloomfield Series

The Bloomfield series consists of well-drained or somewhat excessively drained soils that formed in sandy material along the valley of the ancient Ohio River, which is now occupied by the Cache River. These soils are on low ridges and in level areas, mainly northeast of Olive Branch. The native vegetation was a deciduous forest, consisting principally of oaks.

Representative profile of Bloomfield loamy fine sand, Alexander County, SW¼SW¼NE¼ sec. 27, T. 15 S., R. 2 W.; 50 feet north of center line of road, 300 feet west of house.

Ap—0 to 8 inches, dark-brown (10YR 3/3) loamy fine sand; single grain but tends slightly toward thick, platy structure; friable; slightly acid; abrupt, smooth boundary.

A21—8 to 20 inches, dark yellowish-brown (10YR 4/4) loamy fine sand to fine sand; single grain; friable; slightly acid; gradual, wavy boundary.

A22—20 to 34 inches, brown (7.5YR 4/4) loamy fine sand to fine sand; single grain; friable; medium acid; gradual, wavy boundary.

A23—34 to 42 inches, yellowish-brown (10YR 5/4) loamy fine sand to fine sand; single grain; friable; medium acid; clear, wavy boundary.

B2t—42 to 52 inches, dark yellowish-brown (10YR 4/4) fine sandy loam; weak, medium, subangular blocky structure; slightly firm and compact; medium acid; clear, wavy boundary.

C—52 to 84 inches, fine sand; some thin lenses of sandy loam; slightly acid.

In Pulaski and Alexander Counties, the depth to the B horizon ranges from about 40 inches to 60 inches. The B horizon is weakly developed, and in many places thin bands of Bt material alternate with bands of A2 material. The texture of the Bt bands ranges from fine sandy loam to light sandy clay loam.

In many places the C horizon is somewhat stratified. The reaction ranges from medium acid to nearly neutral but generally is slightly acid.

Bodine Series

The Bodine series is made up of somewhat excessively drained soils that formed in loess less than 20 inches thick over chert bedrock. The chert generally is shattered. Consequently, in many places part of the soil profile is a mixture of loess and chert. In most places the chert is derived from thick deposits, but in a few places it is residual material from decomposed cherty limestone. The Bodine soils are very steep and occur mainly in coves and on lower valley slopes. The native vegetation was a deciduous forest, consisting principally of black oak, white oak, beech, and hickory.

Representative profile of Bodine cherty silt loam, in a forested area, SE¼SE¼NW¼ sec. 28, T. 15 S., R. 2 W.; toward the north end of the west wall, at top of an abandoned silica quarry.

A1—0 to 3 inches, dark grayish-brown (10YR 4/2) cherty silt loam; moderate, medium, granular structure; friable; very strongly acid; abrupt, wavy boundary.

A2—3 to 19 inches, pale-brown (10YR 6/3) cherty silt loam; very weak, subangular blocky structure; friable; extremely acid; gradual, smooth boundary.

B2t—19 to 30 inches, strong-brown (7.5YR 5/6) very cherty heavy silt loam; some moderate, medium, subangular blocky structure apparent between chert fragments; slightly firm; strongly acid; gradual, smooth boundary.

C—30 to 72 inches, strong-brown (7.5YR 5/6) very cherty loam; single grain; loose; many large stones; strongly acid; diffuse, wavy boundary.

R—72 inches to 50 feet +, chert bedrock; stratified layers of white, bluish-gray, light-brown, and yellowish-brown amorphous and crystalline silica rock.

The loess ranges from about 3 to 20 inches in thickness. In some places it contains very few fragments of chert, and in others it contains numerous fragments. The solum ranges from 1 foot to about 3 feet in thickness, depending on the thickness of the loess and on the amount of mixing of the loess with shattered chert. Generally the material below a depth of 20 inches is difficult to penetrate with an auger, spade, or pick. The chert content ranges from 10 to 75 percent in the A horizon, and from 50 to 90 percent in the B horizon. The finer textured material in the B horizon ranges from loam to heavy silt loam. The B horizon ranges from 5YR to 10YR in hue but normally has a hue of 7.5YR.

Bonnie Series

The Bonnie series consists of light-colored, poorly drained soils that formed in acid silt loam sediments derived mainly from adjacent loess-covered uplands. These soils are more than 40 inches thick. They occur mainly on broad, level or nearly level bottom lands. The native vegetation was a deciduous forest, consisting principally of pin oak, red oak, swamp white oak, and cottonwood.

Representative profile of Bonnie silt loam, in a cultivated field, Pulaski County; NW¼SW¼SE¼ sec. 1, T. 15 S., R. 1 W.; 10 feet inside of fence row, southeast of right angle turn in road.

Ap—0 to 4 inches, mixed brown (10YR 5/3) and grayish-brown (2.5Y 5/2) silt loam; few, fine, distinct mottles of yellowish brown (10YR 5/8); very weak, medium and coarse, granular structure; friable; slightly acid; clear, smooth boundary.

B1g—4 to 12 inches mixed light brownish-gray (10YR 6/2) and light-gray (10YR 7/2) silt loam; few or common, fine, distinct mottles of yellowish brown (10YR 5/8); massive; friable; medium acid; clear, smooth boundary.

B2g—12 to 50 inches, gray (10YR 6/1) and grayish-brown (2.5Y 5/2) silt loam; common, medium, distinct mottles of yellowish brown (10YR 5/8); massive; friable; very strongly acid.

The surface layer ranges from 2 to 8 inches in thickness and in many places is dark grayish brown (10YR 4/2). The reaction of the B horizon ranges from medium acid to very strongly acid.

Bowdre Series

The Bowdre series consists of moderately dark colored, poorly drained or somewhat poorly drained soils. These soils formed in nearly neutral silty clay sediments 10 to 30 inches thick over sandy sediments. They occur mainly on gently sloping to moderately sloping ridges, but they are also in level areas and in a few depressions and sloughs. The native vegetation was a deciduous forest, consisting principally of oak, hickory, sycamore, cottonwood, sweetgum, and maple.

Representative profile of Bowdre silty clay, in a cultivated field, Alexander County, NE¼SW¼SW¼ sec. 17, T. 14 S., R. 3 W.; 5 yards south of drainage ditch along Illinois Route 146, and 7 yards east of field lane.

Ap—0 to 6 inches, very dark gray (10YR 3/1) silty clay; weak, medium, subangular blocky structure breaks to moderate, fine, subangular blocky structure; very firm; mildly alkaline; clear, smooth boundary.

B21—6 to 12 inches, very dark gray (10YR 3/1) silty clay; common, fine, distinct mottles of yellowish brown (10YR 4/6); weak, coarse, prismatic structure breaks to moderate, medium and fine, subangular blocky structure; very firm when moist, slightly sticky when wet; mildly alkaline; clear, smooth boundary.

B22—12 to 15 inches, very dark gray (10YR 3/1) heavy clay loam; few, fine, distinct mottles of strong brown (7.5YR 5/8); moderate, fine, subangular blocky structure; firm; mildly alkaline; yellowish-brown (10YR 5/4) sand coats on ped surfaces; clear, smooth boundary.

B3—15 to 18 inches, mixed gray (10YR 5/1) clay loam and yellowish-brown (10YR 5/4) fine sandy loam; few, fine, distinct mottles of strong brown (10YR 5/8); weak, fine, subangular blocky structure; friable; neutral; clear, smooth boundary.

IIC1—18 to 30 inches, dark-brown (10YR 4/3) light fine sandy loam; common, fine, distinct mottles of strong brown (7.5YR 5/8) and light gray (10YR 7/1); single grain; very friable; neutral; worm channels nearly filled with very dark grayish-brown (10YR 3/2) clay loam; gradual, smooth boundary.

IIC2—30 to 40 inches, brown (10YR 4/3) loamy fine sand; few, fine, faint mottles of yellowish brown (10YR 5/8); single grain; loose; neutral; clear, smooth boundary.

IIC3—40 to 45 inches, yellowish-brown (10YR 5/4) loamy fine sand; few, fine, faint mottles of yellowish brown (10YR 5/8); single grain; loose; neutral.

The depth to the sandy substratum ranges from about 10 to 30 inches. In many places a transition layer occurs between the silty clay upper material and the sandy underlying material. This layer ranges from several inches to a

foot in thickness and from silty clay loam to loam in texture. The substratum ranges from loamy fine sand to fine sandy loam.

Cairo Series

The Cairo series consists of dark-colored, nearly neutral, poorly drained soils on gently sloping ridges. These soils formed in clayey sediments 30 to 50 inches thick over sandy sediments. The native vegetation was a deciduous forest, consisting mainly of sycamore, cottonwood, sweetgum, and swamp white oak.

Representative profile of Cairo silty clay, Alexander County, SE¼NE¼SE¼ sec. 18, T. 14 S., R. 3 W.; in a cultivated field north of Illinois Route 146.

Ap—0 to 6 inches, black to very dark gray (10YR 2/1) light silty clay; weak to moderate, fine and medium, angular blocky structure; very firm; neutral; clear, smooth boundary.

B21g—6 to 17 inches, very dark gray (10YR 3/1) silty clay; moderate, very coarse to medium, prismatic structure breaks to moderate to strong, medium and coarse, angular blocky structure; very firm when moist, slightly sticky when wet; common, fine, distinct mottles of yellowish brown (10YR 5/6); black (10YR 2/1) streaks; very dark brown (10YR 2/2) ped exteriors, with common, medium, distinct mottles of strong brown (7.5YR 5/6); neutral; clear, smooth boundary.

B22g—17 to 29 inches, dark-gray (10YR 4/1) light silty clay; weak, medium and coarse, prismatic structure breaks to moderate, fine, angular blocky structure; very firm when moist, slightly sticky when wet; few, fine, faint mottles of yellowish brown (10YR 5/6); very dark grayish-brown (10YR 3/2) ped exteriors, with few, fine, distinct, yellowish-red (5YR 4/8) mottles in upper part to common mottles in lower part; dark-gray (10YR 4/1) channels or streaks with few or common, fine, prominent mottles of yellowish red (5YR 4/8); strong-brown (7.5YR 5/6) coats around channels; neutral; clear, smooth boundary.

C1—29 to 32 inches, very dark gray (10YR 3/1) mixed heavy silty clay loam and clay loam; massive; friable; very dark brown (10YR 2/2) channels, and areas of dark yellowish-brown (10YR 5/4) loamy fine sand that has few, fine, distinct mottles of yellowish red (5YR 4/8) and strong brown (7.5YR 5/6); slightly acid; clear, smooth boundary.

IIC2—32 to 35 inches, dark yellowish-brown (10YR 4/4) loamy fine sand; few, fine, distinct mottles of yellowish red (5YR 4/8), and common, medium, distinct mottles of strong brown (7.5YR 5/6); massive; very friable when moist; channels filled or coated with very dark gray (10YR 3/1) clay loam; slightly acid; gradual, smooth boundary.

IIC3—35 to 65 inches +, yellowish-brown (10YR 5/4) and pale-brown (10YR 6/3) loamy fine sand; scattered very thin iron bands of strong brown (7.5YR 5/8); single grain; loose; slightly acid.

The combined thickness of the surface layer and the upper subsoil ranges from 10 to 20 inches. The surface cracks when the soil is dry. The depth to the sandy material ranges from 30 to 50 inches. In most areas there is a transition layer between the clayey layers and the sandy substratum. This layer ranges from a few inches to more than a foot in thickness and from silty clay loam to loam in texture. The texture of the sandy substratum ranges from fine sandy loam to fine sand.

Cape Series

The Cape series consists of light-colored, poorly drained or very poorly drained soils that formed in 15 to about 40 inches of silty clay loam sediments over silty clay and clay lacustrine or slack-water sediments. These soils occur mainly in broad depressions and in long narrow sloughs. The natural vegetation was a bottom-land hardwood forest, consisting principally of pin oak, tupelo-gum, and cypress.

Representative profile of Cape silty clay loam, Alexander County, NW¼SW¼SE¼ sec. 23, T. 15 S., R. 2 W.; in a cultivated field, 20 feet east of fence corner.

Ap—0 to 7 inches, grayish-brown (2.5Y 5/2) to dark grayish-brown (2.5Y 4/2) silty clay loam; common, very fine, faint mottles of light gray (10YR 7/2); yellowish-red (5YR 4/8) and strong-brown (7.5YR 5/8) iron stains; massive; very firm; slightly acid; abrupt, smooth boundary.

B1g—7 to 24 inches, light brownish-gray (10YR 6/2) silty clay loam; common, medium, distinct mottles of yellowish brown (10YR 5/6 and 5/8); grayish-brown (10YR 5/2) krotovinas; very weak, very fine, angular blocky structure; firm; common small worm channels; strongly acid; clear, smooth boundary.

B2g—24 to 30 inches, olive (5Y 5/3) silty clay; few, fine, faint mottles of yellowish brown (10YR 5/8) and olive yellow (2.5Y 6/8); very weak, very fine, angular blocky structure; few small cleavage planes; plastic and sticky when wet; root channels commonly filled with light olive-gray (5Y 6/2) sticky clay; strongly acid; gradual, smooth boundary.

Cg—30 to 40 inches, olive (5Y 5/3) silty clay; few, medium, prominent mottles of greenish gray (5G 5/1 and 5BG 5/1); massive; sticky and plastic when wet; strongly acid.

The thickness of the silty clay loam layer ranges from 15 inches to about 40 inches. The reaction of the B and C horizons is strongly acid or medium acid, but in Pulaski and Alexander Counties it generally is strongly acid. The silty clay sediments ordinarily are several feet thick.

Darwin Series

The Darwin series consists of poorly drained or very poorly drained, moderately dark colored, fine textured or moderately fine textured soils that formed in slack-water and lacustrine sediments from the Mississippi and Ohio Rivers. These soils are in level or nearly level areas and in depressions and sloughs. They developed under a bottom-land hardwood forest, consisting principally of pin oak, cottonwood, tupelo-gum, and cypress.

Representative profile of Darwin silty clay, in cultivated area, Alexander County, SE¼SW¼SW¼ sec. 21, T. 14 S., R. 3 W.; west bank of drainage ditch on west side of Illinois Route 3, 150 feet north of field entrance.

A1—0 to 14 inches, very dark gray (10YR 3/1) silty clay; strong, fine, angular blocky structure; very firm; numerous roots; slightly acid; gradual, smooth boundary.

B2g—14 to 40 inches, dark-gray (10YR 4/1) silty clay or clay; common, fine, distinct mottles of dark brown (7.5YR 4/4); weak, medium, angular blocky structure; very firm; numerous roots; neutral; gradual, smooth boundary.

Cg—40 to 55 inches, gray (10YR 5/1) silty clay; common, large, distinct mottles of yellowish brown (10YR 5/6); massive; firm; some fine lime concretions; moderately alkaline.

The thickness of the A horizon ranges from 10 to 15 inches. The color of the surface layer ranges from 10YR 2/2 to 10YR 3/1. The reaction generally is slightly acid or neutral.

Also mapped is a silty clay loam type, in which the surface layer is 15 to 40 inches thick.

DISCO SERIES

The Disco series consists of well-drained soils that formed in sandy sediments deposited by the Mississippi and Ohio Rivers. These soils are on level and gently sloping low terraces, west of Horseshoe Lake. The native vegetation consisted of prairie grasses.

Representative profile of Disco fine sandy loam, in a cultivated field, Alexander County, SE¼SE¼SE¼ sec. 18, T. 16 S., R. 2 W.; 600 feet east of slough, 200 feet north of field lane.

Ap—0 to 8 inches, very dark brown (10YR 2/2) fine sandy loam; single grain; friable; medium acid; abrupt, smooth boundary.

B1—8 to 14 inches, very dark brown (10YR 2/2) loam; very weak, medium, granular structure and very weak, fine, subangular blocky structure; friable; very dark grayish-brown (10YR 3/2) worm casts; few fine pores; strongly acid; clear, smooth boundary.

B2—14 to 24 inches, very dark brown (10YR 2/2) loam; very weak, medium, subangular blocky structure; friable; very dark brown (10YR 2/2) worm casts; few fine pores; medium acid; clear, smooth boundary.

B3—24 to 29 inches, very dark grayish-brown (10YR 3/2) fine sandy loam; very weak, medium, subangular blocky structure; friable; very dark brown (10YR 2/2) worm casts; common fine pores; medium acid; clear, smooth boundary.

C1—29 to 59 inches, 70 percent brown (10YR 4/3) and 30 percent dark-brown (10YR 3/3) loamy fine sand; few dark-gray (10YR 4/1) worm casts; single grain; very friable; slightly acid.

C2—59 to 75 inches, brown (10YR 4/3) loam; single grain; friable; neutral.

C3—75 to 87 inches +, brown (10YR 4/3) loamy fine sand; single grain; slightly acid.

The surface horizon ranges from fine sandy loam to loam in texture, and the B horizon ranges from fine sandy loam to silt loam. In places the B horizon is sandy clay loam and is less than 10 inches thick. The reaction ranges from strongly acid to mildly alkaline.

DRURY SERIES

The Drury series consists of well-drained soils that formed in silty alluvial and colluvial material washed from bluffs along the Mississippi River. These soils are on gently sloping to strongly sloping foot slopes at the base of the bluffs. The native vegetation was a deciduous forest, consisting mainly of red gum, tulip-poplar, walnut, and oak.

Representative profile of Drury silt loam, in a pasture, Alexander County, NE¼SE¼SE¼ sec. 22, T. 14 S., R. 3 W.; along lane, 270 feet north of creek, and 100 feet east of lane to gully.

A1—0 to 4 inches, dark grayish-brown (10YR 4/2) silt loam; moderate, fine and medium, granular structure; friable; neutral; clear, smooth boundary.

A2—4 to 9 inches, dark yellowish-brown (10YR 4/4) silt loam; moderate, thin and medium, platy structure; friable; few fine pores; neutral; clear, smooth boundary.

B21—9 to 19 inches, dark-brown (10YR 4/3) silt loam; moderate, medium, subangular blocky structure; friable; few fine pores; slightly acid; clear, smooth boundary.

B22—19 to 27 inches, dark-brown (10YR 4/3) silt loam; weak, coarse, subangular blocky structure breaks to very weak, medium, subangular blocky structure; friable; scattered thin small coats of light brownish-gray (10YR 6/2) very fine sand; fine iron-manganese concretions are common; common very fine pores; slightly acid; gradual, smooth boundary.

B3—27 to 36 inches, dark yellowish-brown (10YR 4/4) silt loam; few, fine, distinct mottles of yellowish brown (10YR 5/8); weak, coarse, subangular blocky structure to massive; friable; scattered coats of light brownish-gray (10YR 6/2) very fine sand; fine iron-manganese concretions are common; common very fine pores; slightly acid; clear, smooth boundary.

C—36 to 53 inches +, dark yellowish-brown (10YR 4/4) silt loam; yellowish-brown (10YR 5/8) mottles; massive; slightly firm; common light brownish-gray (10YR 6/2) coats of very fine sand or coarse silt; fine iron-manganese concretions are common; common very fine pores; slightly acid.

The reaction is slightly acid or neutral. The texture of the B horizon is light or medium silt loam, and the structure ranges from very weak to moderate.

DUPO SERIES

In the Dupo series are light-colored, somewhat poorly drained soils. These soils formed in 15 to 40 inches of silt loam sediments over moderately dark colored lacustrine or slack-water sediments of the Mississippi and Ohio Rivers. In most areas the upper 15 to 40 inches consists of silty sediments washed from adjacent loessal uplands, but near the Mississippi River it includes river sediments. The native vegetation was a deciduous forest, consisting mainly of cottonwood, sycamore, and sweetgum.

Representative profile of Dupo silt loam, in roadside grasses, Pulaski County, SW¼NW¼NE¼ sec. 23, T. 15 S., R. 1 W.

A1—0 to 11 inches, brown (10YR 4/3) silt loam; weak, medium, granular structure; friable; slightly acid; gradual, smooth boundary.

C1—11 to 21 inches, brown (10YR 5/3) silt loam; many, fine, faint mottles of pale brown (10YR 6/3), and few, fine, distinct mottles of yellowish brown (10YR 5/8); massive; friable; slightly acid; clear, smooth boundary.

C2—21 to 29 inches, thin strata of brown (10YR 5/3), dark-brown (10YR 4/2), and pale-brown (10YR 6/3) silt loam; massive; friable; slightly acid; many fine pores; abrupt, wavy boundary.

IIC3—29 to 39 inches, very dark gray (10YR 3/1) silty clay loam; few, fine and medium, distinct yellowish-brown (10YR 5/5) mottles and stains; massive; slightly firm; many fine pores; slightly acid; diffuse boundary.

IIC4—39 to 50 inches +, dark-gray (10YR 4/1) silty clay loam; few, fine and medium, distinct yellowish-brown (10YR 5/5) mottles and stains; massive; firm when moist, slightly sticky when wet; common medium pores; medium iron-manganese concretions are common; slightly acid.

The finer textured substratum ranges from silty clay loam to silty clay. The depth to the finer textured substratum ranges from 15 to 40 inches. Normally, the reaction of the upper layers is slightly acid or neutral, but on bottom lands along the Cache River, the reaction ranges from strongly acid to slightly acid within the same field. The reaction of the finer textured substratum is slightly acid or neutral.

ELSAH SERIES

The Elsah series consists of light-colored, moderately well drained or well drained soils that formed in 15 to 40 inches of silt loam sediments derived mainly from surrounding loess-covered uplands. These soils are underlain by cherty sediments, and fragments of chert are mixed with the soil material. The Elsah soils are on narrow to wide, level to gently sloping bottom lands. The native vegetation was a deciduous forest, consisting mainly of oak, sweetgum, sycamore, and yellow-popular.

Representative profile of Elsah silt loam, in a wooded pasture, Alexander County, NE¼NE¼SE¼ sec. 12, T. 15 S., R. 3 W.; north bank of a straightened stream channel, 30 feet east of point where the new cut joins the old channel.

A1—0 to 10 inches, dark-brown (10YR 4/3) silt loam; few chert fragments; weak, medium, granular structure; friable; slightly acid; gradual, wavy boundary.

C1—10 to 22 inches, brown (10YR 4/3) silt loam; more chert fragments than in A1 horizon; massive; friable; slightly acid; clear, wavy boundary.

IIC2—22 to 32 inches, dark-brown (7.5YR 3/4) cherty loam; single grain; loose; slightly acid; gradual, wavy boundary.

IIC3—32 to 70 inches +, dark-brown (7.5YR 4/4) loamy chert; single grain; loose; slightly acid.

The reaction ranges from slightly acid to neutral. Grayish mottles commonly occur in the silt loam sediments, just above the cherty layer. In some places the cherty substratum consists of stratified layers of cherty loam and silt loam. In most places the chert is ½ inch to 3 inches in diameter. In some areas south and east of Thebes, there is rounded gravel, ½ inch to 1½ inches in diameter, instead of chert.

Ginat Series

The Ginat series consists of poorly drained soils that formed in silty alluvium from the Ohio River. These soils are on low, level to gently sloping terraces along the Cache and Ohio Rivers. The original vegetation was a deciduous forest, consisting mainly of pin oak, hickory, sycamore, and cottonwood.

Representative profile of Ginat silt loam, in a cultivated field, Pulaski County, NE¼SE¼NE¼ sec. 18, T. 14 S., R. 2 E.; 430 feet west of highway, from a point 500 feet south of lane.

Ap—0 to 8 inches, dark grayish-brown (10YR 4/2) silt loam; weak, medium, granular structure; friable; slightly acid; abrupt, smooth boundary.

A2—8 to 17 inches, light brownish-gray (10YR 6/2) silt loam; few, fine, distinct mottles of yellowish brown (10YR 5/6); very weak, medium, platy structure; friable; few, very fine, soft iron concretions; strongly acid; abrupt, smooth boundary.

B21t—17 to 22 inches, light brownish-gray (2.5Y 6/2) silty clay loam; few, fine, distinct mottles of yellowish brown (10YR 5/6), and common, fine, distinct mottles of light gray (10YR 7/2); weak, medium, subangular blocky structure; grayish-brown to light grayish-brown (10YR 5/2 to 6/2) ped surfaces; firm; very fine iron concretions are common; very strongly acid; clear, wavy boundary.

B22t—22 to 28 inches, light brownish-gray (2.5Y 6/2) heavy silty clay loam; common, fine, distinct mottles of light gray (10YR 7/2 to 8/2), and few, fine, distinct mottles of yellowish brown (10YR 5/6); moderate, medium, prismatic structure; firm; strongly acid; clear, wavy boundary.

B23t—28 to 35 inches, light brownish-gray (2.5Y 6/2) silty clay loam; few, fine, distinct mottles of yellowish brown (10YR 5/4 to 5/6); and black (10YR 2/1) iron-manganese streaks and coats; moderate, coarse, subangular blocky structure; firm; medium acid; clear, wavy boundary.

B3x—35 to 47 inches, grayish-brown (10YR 5/2) silty clay loam; common, very fine, distinct mottles of white (10YR 8/2); many, fine, black (10YR 2/1) iron-manganese streaks and coats; weak, medium, subangular blocky structure; firm; slightly fragile; many fine iron concretions; slightly acid; clear, wavy boundary.

C—47 to 51 inches, light-gray to white (10YR 7/2 to 8/2) light silty clay loam; common fine mottles of yellowish brown (10YR 5/6 and 5/8), and few fine mottles of light grayish brown (10YR 6/2); massive; firm; slightly fragile; many fine iron concretions; neutral.

The A horizon ranges from 12 to 24 inches in thickness and from light silt loam to heavy silt loam in texture. The texture of the B horizon ranges from light silty clay loam to silty clay. In some places the solum contains considerable sand, and it generally contains a notable amount of mica. In places there are stratified sandy and clayey sediments in the substratum. In some places there is a very weak fragipan.

Gorham Series

The Gorham series consists of moderately dark colored, somewhat poorly drained soils that formed in silty clay loam sediments 30 to 50 inches thick over sandy sediments. These soils are on level to gently sloping bottom lands along the Mississippi River. The native vegetation consisted of deciduous bottom-land hardwoods, mainly maple, cottonwood, and sycamore.

Representative profile of Gorham silty clay loam, in a cultivated field, Alexander County, NW¼NW¼SE¼ sec. 15, T. 17 S., R. 2 W.; 30 feet north of REA pole, 60 feet east of centerline of road.

Ap—0 to 6 inches, very dark grayish-brown (10YR 3/2) silty clay loam; weak, fine and medium, angular blocky structure; firm; mildly alkaline; abrupt, smooth boundary.

A1—6 to 12 inches, very dark grayish-brown (10YR 3/2) heavy silty clay loam; very weak, medium, prismatic and angular blocky structure; firm; compact (plowpan); mildly alkaline; abrupt, smooth boundary.

B21—12 to 17 inches, very dark grayish-brown (10YR 3/2) silty clay loam; weak, fine, angular blocky structure; firm; very dark brown (10YR 2/2) ped faces; mildly alkaline; clear, smooth boundary.

B22—17 to 19 inches, very dark gray (10YR 3/1) silty clay loam; moderate, coarse, angular blocky structure; firm; mildly alkaline; abrupt, smooth boundary.

C1—19 to 28 inches, dark grayish-brown (10YR 4/2) heavy silt loam; common, fine, distinct mottles of brown (10YR 5/3); massive; friable; few worm channels and very fine pores; very dark grayish-brown (10YR 3/2) coats on worm channels; mildly alkaline; clear, smooth boundary.

C2—28 to 34 inches, very dark grayish-brown (10YR 3/2) silt loam; weak, fine, granular structure; friable; numerous worm casts; common worm channels; mildly alkaline; gradual, wavy boundary.

IIC3—34 to 49 inches, brown (10YR 5/3) fine sandy loam; common, fine, distinct mottles of light gray (10YR 7/2); massive; friable; worm channels coated or filled with dark grayish brown (10YR 4/2); abundant mica flakes; mildly alkaline; gradual, wavy boundary.

IIC4—49 to 60 inches, gray (7.5YR 5/1) silt loam and gray (7.5YR 6/1) fine sandy loam, stratified in 3- to 6-inch layers; sandy loam dominant; massive; friable; common, medium, distinct mottles of dark brown (7.5YR 4/4) and strong brown (7.5YR 5/6); mildly alkaline; gradual boundary.

IIC5—60 to 86 inches +, stratified brown and light-brown (7.5YR 5/4 and 6/4, mixed) fine sandy loam and brown (7.5YR 5/2) silt loam; few, fine, faint mottles of dark brown (7.5YR 4/4); mildly alkaline.

The Mississippi bottom lands in Alexander County are extremely variable. In many places there are strata of silt loam and silty clay in the Gorham soils. A layer of silt loam, loam, or clay loam, from 2 to 15 inches thick, commonly occurs between the silty clay loam and the underlying sandy material. This layer is considered part of the finer textured upper layer. The texture of the sandy material ranges from fine sandy loam to fine sand. The reaction ranges from slightly acid to mildly alkaline.

Harvard Series

The Harvard series consists of well drained or moderately well drained soils that formed in medium-textured alluvium over stratified sediments. The materials from which these soils developed were deposited by either the Ohio River or the Mississippi River. These soils are on nearly level to gently sloping, very low terraces west and south of Horseshoe Lake. The native vegetation consisted of grasses and scattered trees.

Representative profile of Harvard silt loam, in a cultivated field, Alexander County, SE¼NE¼NE¼ sec. 11, T. 16 S., R. 3 W.

Ap—0 to 6 inches, dark-brown (10YR 3/3) silt loam; weak, very fine and fine, granular structure; friable; moderately alkaline; abrupt, smooth boundary.

A1—6 to 9 inches, dark-brown (10YR 3/3) silt loam; weak to moderate, thin and medium, platy structure; very slightly brittle (plowpan); friable when crushed; no pores; mildly alkaline; abrupt, smooth boundary.

A2—9 to 15 inches, brown (10YR 5/3 and 4/3) silt loam; common, fine and medium, faint mottles of yellowish brown (10YR 5/6); very weak, very fine and fine, subangular blocky structure in the lower part; friable; common fine pores, and few medium pores and worm channels; common very dark gray (10YR 3/1) worm casts; mildly alkaline; clear, smooth boundary.

B1—15 to 19 inches, dark yellowish-brown (10YR 4/4) light silty clay loam; moderate, fine and medium, subangular blocky structure; friable to slightly firm; common, patchy, thin, dark-brown (10YR 3/4) clay films; very fine black iron-manganese concretions are common; common fine pores; mildly alkaline; clear, wavy boundary.

B2t—19 to 34 inches, dark yellowish-brown (10YR 4/4) clay loam; moderate to strong, prismatic structure breaks to moderate, coarse, subangular blocky structure; firm; continuous, thin, dark yellowish-brown (10YR 3/4) clay films; common fine pores; very fine black iron-manganese concretions are common; slightly acid; clear, wavy boundary.

B3—34 to 41 inches, dark yellowish-brown (10YR 4/4) sandy clay loam to fine sandy loam; few, thin, strong-brown (7.5YR 5/8) streaks; few, coarse, distinct mottles of light brownish gray (10YR 6/2); weak, coarse and medium, prismatic structure breaks to very weak and weak, fine, subangular blocky structure; friable; few, thin, dark yellowish-brown (10YR 3/4) clay films; thin, pale-brown (10YR 6/3), sandy ped coats; common very fine pores; slightly acid; clear, wavy boundary.

C1—41 to 61 inches, dark yellowish-brown (10YR 4/4) fine sandy loam to loam; massive; friable; slightly acid; clear boundary.

C2—61 to 79 inches +, yellowish-brown (10YR 5/4) loamy fine sand; single grain; slightly acid.

The texture of the A horizon is silt loam or loam, and in most places the A2 horizon is coarser textured than the surface horizon. The depth to the underlying stratified material ranges from 30 inches to more than 60 inches. The thickness and texture of the underlying strata vary considerably. The reaction ranges from mildly alkaline to medium acid, and the A horizon generally is less acid than the B horizon. The high reaction is believed to result from resaturation with bases during periods of overflow.

Haymond Series

The Haymond series consists of well-drained, light-colored soils that formed in slightly acid or neutral silt loam sediments derived mainly from very thick deposits of loess on nearby uplands. These soils occur as small and medium-sized bottom lands. The native vegetation was a deciduous forest, consisting mainly of white oak, walnut, gum, and yellow-poplar.

Representative profile of Haymond silt loam, in a cultivated field, Alexander County, SW¼SE¼SW¼ sec. 10, T. 15 S., R. 3 W.; 240 feet east of field lane at bend in road, 30 feet south of centerline of road.

Ap—0 to 5 inches, brown (10YR 4/3) silt loam; moderate, fine and medium, granular structure; friable; neutral; abrupt, wavy boundary.

C1—5 to 13 inches, brown (10YR 4/3) silt loam; weak, fine, granular structure to massive; friable; neutral; abrupt, smooth boundary.

C2—13 to 27 inches, dark-brown (10YR 3/3) to brown (10YR 4/3) silt loam; massive; friable; fine and medium worm channels are common; neutral; gradual, wavy boundary.

C3—27 to 35 inches, brown (10YR 4/3) silt loam; few, fine and medium, distinct mottles of light brownish gray (10YR 6/2); few dark grayish-brown (10YR 4/2) coats; massive; friable; common, fine and very fine pores; slightly acid; gradual, smooth boundary.

C4—35 to 50 inches +, dark yellowish-brown (10YR 4/4) silt loam; few, fine, distinct mottles of pale brown (10YR 6/3); massive; friable; common very fine pores; slightly acid.

The texture of the Haymond soils tends to be coarse silt loam, and in some places it approaches very fine sandy loam. In many places chert is scattered throughout the soil material.

Hosmer Series

The Hosmer series consists of moderately well drained soils that contain a fragipan. These soils formed in loess that ordinarily is more than 48 inches thick and in many places is more than 80 inches thick. The loess generally is underlain by Coastal Plain gravel, sand, or clay. The Hosmer soils are on the uplands throughout Pulaski County and on foot slopes in Alexander County. The native vegetation was a deciduous forest, consisting mainly of white oak, red oak, hickory, maple, and elm.

Representative profile of Hosmer silt loam, in a forested area, Pulaski County, SW¼NE¼NE¼ sec. 16, T. 15 S., R. 1 E.; south side of road cut, 105 feet ESE. of private road.

A1—0 to 2 inches, very dark grayish-brown (10YR 3/2) silt loam; moderate, medium, crumb structure; friable; many rotting leaves, and many roots up to ¼ inch in diameter; strongly acid; abrupt, smooth boundary.

A2—2 to 11 inches, dark yellowish-brown (10YR 4/4) silt loam; moderate, medium and coarse, granular structure; friable; moderate number of worm channels, and moderate number of roots up to ¼ inch in diameter; very strongly acid; clear, slightly wavy boundary.

B1—11 to 17 inches, yellowish-brown (10YR 5/4) silt loam; moderate, medium, subangular blocky structure; friable; very strongly acid; clear, smooth boundary.

B2t—17 to 27 inches, yellowish-brown (10YR 5/6) heavy silt loam to light silty clay loam; light yellowish-brown (10YR 6/4) coats on ped faces; moderate, fine and medium, subangular blocky structure; very slightly plastic; few small roots, and moderate number of worm channels; very strongly acid; abrupt, wavy boundary.

A'2—27 to 31 inches, mixed pale-brown (10YR 6/3) and yellowish-brown (10YR 5/6) heavy silt loam; moderately heavy ped coats of very pale brown (10YR 8/3, dry); moderate, fine and medium, angular blocky structure; slightly firm; few roots, and few small worm channels; few iron-manganese concretions; very strongly acid; abrupt, wavy boundary.

B'2tx—31 to 44 inches, mixed yellowish-brown (10YR 5/8) and light yellowish-brown (10YR 6/4) silty clay loam to light silty clay loam; ped coats of very pale brown

(10YR 8/3, dry), thick on smaller peds, and nearly lacking on larger peds; moderate, medium and coarse, angular and subangular blocky structure; firm; few roots; few worm channels, some filled with gray silty material; scattered iron-manganese concretions; very strongly acid; gradual, smooth boundary.

B′3x—44 to 60 inches, mixed yellowish-brown (10YR 5/8) and white (10YR 8/2) heavy silt loam; massive; firm; few roots in cracks or along aggregate faces; more worm channels than in horizon above; some cracks and worm holes filled with gray silica flour; few iron-manganese concretions; very strongly or strongly acid.

The depth to the fragipan ranges from 20 to 36 inches, depending mainly on the degree of erosion. The A′2 horizon ranges from a well-defined gray horizon to a discontinuous layer of peds, heavily coated with silt. Where these soils occur in Alexander County the fragipan is less well expressed. In Alexander County there is a transition area where the Hosmer soils intergrade toward the Muren. In this area the fragipan is moderate or weak, the texture of the B2 horizon ranges from heavy silt loam to light silty clay loam, and the colors in the B′2tx horizon range from highly mottled to almost unmottled.

Hurst Series

The Hurst series consists of somewhat poorly drained soils that formed in silty material over very fine textured sediments. These soils are mainly in level areas and on the short slopes of low terraces along the Cache River. The native vegetation was a deciduous forest, consisting mainly of red oak, white oak, black oak, and hickory.

Representative profile of Hurst silt loam, in a cultivated field, Alexander County, NE¼NE¼SE¼ sec. 13, T. 15 S., R. 2 W.; 175 feet east of Illinois Route 127, 27 feet south of fence corner, on west side of highway.

Ap—0 to 6 inches, brown (10YR 4/3) silt loam; moderate, medium, granular structure; friable; common, fine and medium, iron-manganese concretions; strongly acid; abrupt, smooth boundary.

A2—6 to 12 inches, light brownish-gray (10YR 6/2) and pale-brown (10YR 6/3) silt loam; few, fine, faint mottles of light yellowish brown (10YR 6/4), and common, fine, distinct mottles of yellowish brown (10YR 5/6 and 5/8); weak, thick, platy structure breaks to very weak, fine, subangular blocky structure; friable; few fine pores; fine and medium iron-manganese concretions are common; very strongly acid; abrupt, wavy boundary.

B1—12 to 15 inches, light brownish-gray (2.5Y 6/2) silty clay loam; common, fine, distinct mottles of yellowish brown (10YR 5/6 and 5/8); weak, fine, prismatic structure breaks to moderate, medium, subangular blocky structure; firm; common fine pores; few fine iron-manganese concretions; grayish-brown (10YR 5/2) ped faces have gray (10YR 6/1) silica coats when moist, white (10YR 8/1) silica coats when dry; very strongly acid; clear, wavy boundary.

B21t—15 to 25 inches, brown (10YR 5/3) light silty clay; few, fine, distinct mottles of brownish yellow (10YR 6/8), and common, medium, distinct mottles of strong brown (7.5YR 5/6 and 5/8); moderate, coarse, subangular and angular blocky structure breaks to moderate, fine, angular blocky; very firm when moist, plastic when wet; very strongly acid; clear, wavy boundary.

B22t—25 to 36 inches, brown (10YR 5/3) silty clay; common, fine, faint mottles of yellowish brown (10YR 5/6 and 5/8); very weak, coarse, subangular blocky structure breaks to weak, very fine, subangular blocky structure; firm when moist, plastic when wet; some slickensides; very strongly acid; clear boundary.

B31t—36 to 48 inches, brown (10YR 5/3) light silty clay; common, fine, faint mottles of yellowish brown (10YR 5/6 and 5/8); very weak, very fine, angular blocky structure; firm; few very fine manganese concretions; gray (10YR 5/1) clay films on root channels; extremely acid; gradual boundary.

B32—48 to 60 inches +, grayish-brown (2.5Y 5/2) silty clay loam; common, medium, prominent mottles of strong brown (7.5YR 5/6 and 5/8); very weak, very fine, angular blocky structure; firm; few, discontinuous, grayish-brown coats on peds; few, fine, soft iron concretions; extremely acid.

In some places the silty clay loam upper B horizon is lacking. In other places it ranges from 3 to 12 inches or more in thickness.

Jacob Series

The Jacob series consists of light-colored, very poorly drained soils that formed in very strongly acid, very fine textured lacustrine or slack-water deposits. These soils are mainly on level or nearly level bottom lands near the Cache River. The native vegetation was a deciduous forest, consisting mainly of pin oak, tupelo-gum, and cypress.

Representative profile of Jacob clay, in a cultivated field, Alexander County, SW¼SE¼SE¼ sec. 12, T. 16 S., R. 2 W.; 150 feet north of the Mounds blacktop road, 300 feet east of State Route 127.

Ap—0 to 6 inches, grayish-brown (10YR 5/2) clay; common, fine, faint mottles of gray (10YR 6/1); very weak, medium, subangular blocky structure; very firm when moist, very plastic when wet; medium acid; many iron-manganese concretions; abrupt, smooth boundary.

B21g—6 to 24 inches, light-gray (10YR 6/1) clay; common, medium, prominent mottles of yellowish red (5YR 4/8); weak to very weak, fine, angular blocky structure; very firm when moist, very plastic when wet; very strongly acid; gradual, wavy boundary.

B22g—24 to 50 inches, light brownish-gray (2.5Y 6/2) clay; few, fine, prominent mottles of yellowish red (5YR 4/8); massive; very firm when moist, very plastic when wet; very strongly acid.

In most places the surface horizon is dark grayish brown (10YR 4/2). It is 2 or 3 inches thick in forested areas. The texture of the solum is silty clay or clay. The pH ranges from 4.0 to 5.0, but it is allowed to range slightly above 5.0 if the color value of the surface horizon is 5 or lighter. Below a depth of 20 inches, structure generally is lacking. In most places the Jacob soils are underlain by thick beds of clay.

Karnak Series

The Karnak series consists of light-colored, very poorly drained soils that formed in fine-textured lacustrine or slack-water deposits more than 40 inches thick. These soils occur mainly in broad depressions and in long, narrow sloughs. The native vegetation was a deciduous forest, consisting principally of pin oak, sweetgum, tupelo-gum, and cypress.

Representative profile of Karnak silty clay, in a cultivated field, Pulaski County, NW¼NW¼NE¼ sec. 35, T. 14 S., R. 2 E.; 50 feet south of centerline of road, 200 feet east of fence row.

Ap—0 to 7 inches, dark grayish-brown (10YR 4/2) silty clay; few, fine, distinct mottles of dark yellowish brown (10YR 5/6); weak, fine and medium, subangular blocky structure; firm; neutral; clear, smooth boundary.

B1g—7 to 13 inches, dark-gray (10YR 4/1) silty clay; few, medium, prominent mottles of strong brown (7.5YR 5/6); weak, medium, subangular blocky structure; very firm; dark-gray (N 4/0) ped surfaces; slightly acid; gradual, smooth boundary.

B21g—13 to 20 inches, dark-gray (10YR 4/1) silty clay; many, medium, distinct mottles of yellowish brown (10YR 5/6); weak, medium, prismatic structure breaks to moderate, medium, subangular blocky structure; very firm; dark-gray (2.5Y 4/1) ped surfaces; slightly acid; gradual, smooth boundary.

B22g—20 to 30 inches, gray (10YR 5/1) silty clay; many, medium, prominent mottles of strong brown (7.5YR 5/6); moderate, fine and medium, subangular and angular blocky structure; very firm; dark-gray (10YR 4/1) ped surfaces; neutral; gradual, smooth boundary.

Cg—30 to 45 inches, mixed gray (10YR 5/1) and strong-brown (7.5YR 5/6) silty clay; massive; very firm; moderately alkaline.

In most places the surface horizon is dark gray (10YR 4/1), but if it is less than 8 inches thick, it may be very dark gray (10YR 3/1). The reaction ordinarily is slightly acid or neutral but in places ranges to strongly acid. The structure ranges from subangular to angular blocky and from weak to moderate. It extends to a depth of 20 to 30 inches. In most areas the Karnak soils are underlain by thick beds of clay, but in some areas, especially on slight ridges, they are underlain by sandy material below a depth of 40 or 50 inches.

Lamont Series

The Lamont series consists of well-drained soils that formed in fine sand deposited by wind or water. These soils are on level and moderately sloping terraces along the Cache River. The native vegetation was a deciduous forest, consisting mainly of oak, ash, sweetgum, and maple.

Representative profile of Lamont fine sandy loam, in a cultivated field, Alexander County, SE¼SE¼SE¼ sec. 19, T. 16 S., R. 2 W.; 35 feet east of centerline of road.

Ap—0 to 8 inches, dark grayish-brown (10YR 4/2) fine sandy loam; single grain; friable; neutral; abrupt, smooth boundary.

A21—8 to 13 inches, yellowish-brown (10YR 5/4) loamy fine sand to fine sandy loam; common, dark grayish-brown (10YR 4/2) worm casts; single grain; very slightly brittle and firm in place (plowpan), friable when crushed; slightly acid; clear, smooth boundary.

A22—13 to 23 inches, brown (10YR 5/3) loamy fine sand to fine sandy loam; single grain; friable; slightly acid; abrupt, slightly wavy boundary.

B1—23 to 33 inches, dark-brown (10YR 4/3) fine sandy loam; weak, medium, subangular blocky structure; friable; few, thin, dark grayish-brown (10YR 3/3) clay films; few fine pores; medium acid; clear, wavy boundary.

B2—33 to 41 inches, mixed brown (10YR 4/3) and yellowish-brown (10YR 5/4) fine sandy loam; moderate, medium, subangular blocky structure; friable; common, thin, dark-brown (10YR 3/3) clay films; common fine pores; fine and medium black iron-manganese concretions are common; medium acid; clear, wavy boundary.

B3—41 to 56 inches, brown (10YR 4/3) fine sandy loam; very few, fine, distinct mottles of dark yellowish brown (10YR 5/6); few, fine, very dark brown (10YR 2/2) iron-manganese stains; weak, coarse, subangular blocky structure; friable; few fine pores; very strongly acid; clear, wavy boundary.

C1—56 to 58 inches, mixed brown (10YR 5/3) and dark yellowish-brown (10YR 4/4) silty clay loam; few, fine, distinct mottles of strong brown (7.5YR 5/6); massive; firm; very strongly acid; abrupt boundary.

C2—58 to 65 inches +, stratified dark-brown (10YR 4/3) loam and brown (10YR 5/3) loamy fine sand; single grain; friable to loose; strata approximately 5 inches thick; very strongly acid.

The B horizon generally is fine sandy loam or loam, but in places it contains thin layers, less than 10 inches thick, of silt loam or clay loam, and in others it contains thin lenses or bands of fine sandy loam. The depth to the B horizon varies, but in most places it is less than 30 inches. The substratum ordinarily is loamy fine sand or fine sandy loam, but in places it contains layers of finer textured material.

Landes Series

The Landes series consists of moderately dark colored, well-drained soils that formed in fine sandy loam sediments more than 20 inches thick over loamy fine sand to sand. These soils are on bottom lands along the Mississippi River. The natural vegetation was a deciduous forest, consisting mainly of maple, cottonwood, and sycamore.

Representative profile of Landes fine sandy loam, in a cultivated field, Alexander County, SE¼SE¼NE¼ sec. 8, T. 14 S., R. 3 W.; 600 feet north of south fence, 50 feet west of east fence.

Ap—0 to 8 inches, very dark grayish-brown (10YR 3/2) to dark-brown (10YR 3/3) fine sandy loam; weak, fine, crumb structure; friable; neutral; clear, smooth boundary.

A11—8 to 12 inches, very dark grayish-brown (10YR 3/2) to dark-brown (10YR 3/3) fine sandy loam; moderate, fine, crumb structure; friable; few very dark grayish-brown (10YR 3/2) worm casts; streaks of brown (7.5YR 4/4) on root channels; neutral; clear, smooth boundary.

A12—12 to 15 inches, dark-brown (10YR 3/3) to brown (10YR 4/3) fine sandy loam; weak, fine, crumb structure; friable; very dark grayish-brown (10YR 3/2) worm casts; root channels streaked with dark brown (7.5YR 4/4 and 3/2); neutral or mildly alkaline; clear, smooth boundary.

C1—15 to 25 inches, dark grayish-brown (10YR 4/2) to brown (10YR 4/3) light fine sandy loam, streaked with very thin, parallel lenses of very dark grayish-brown (10YR 3/2) to dark grayish-brown (10YR 4/2) fine sandy loam and noticeable mica; massive; very friable; very dark grayish-brown (10YR 3/2) worm casts; dark-brown (7.5YR 4/4) coats on worm channels; neutral to calcareous; abrupt, smooth boundary.

C2—25 to 37 inches, grayish-brown (10YR 5/2) to brown (10YR 5/3) loamy fine sand; few lenses of dark-brown (10YR 3/3) loamy material, 2 to 5 millimeters thick; single grain; loose; calcareous; abrupt, smooth boundary.

C3—37 to 44 inches, dark-gray (10YR 4/1) to gray (10YR 5/1) silt loam; common, fine and medium, prominent, brown (7.5YR 4/4) and dark reddish-brown (5YR 3/4) iron stains, and few, fine, prominent, strong-brown (7.5YR 5/6) iron stains; weak, fine, crumb structure; friable; calcareous; clear, smooth boundary.

C4—44 to 48 inches, grayish-brown (2.5Y 5/2) very fine sandy loam; common, fine, prominent iron stains of dark reddish brown (5YR 3/4), yellowish red (5YR 4/6 and 4/8), and strong brown (7.5YR 5/6 and 5/8); massive; friable; calcareous.

C5—48 to 60 inches, loamy fine sand, stratified with loam to sandy clay loam.

The fine sandy loam surface layer ranges from 20 to 40 inches in thickness, but typically it is about 25 inches thick. Although the loamy fine sand substratum commonly is stratified with silty clay loam to fine sand, in places it consists entirely of loamy fine sand or fine sand to a depth of several feet. The reaction ranges from neutral to mildly alkaline.

Markland Series

The Markland series consists of moderately well drained soils that formed in a thin layer of medium-textured material over very fine textured sediments deposited by the ancient Ohio River. These soils are on ridges and on the side slopes of terraces on bottom lands along the Cache

River. The native vegetation was a deciduous forest, consisting mainly of oak, hickory, and maple.

Representative profile of Markland soils, severely eroded, on a roadside, Alexander County, NW¼SE¼SE¼ sec. 12, T. 15 S., R. 2 W.; east road bank, Illinois Route 127, 80 feet north of REA pole, south side of drainageway.

Ap—0 to 4 inches, grayish-brown (10YR 5/2) silty clay loam; weak, fine, subangular blocky structure and weak, moderate, granular structure; firm; strongly acid; abrupt, smooth boundary.

B21t—4 to 11 inches, brown (10YR 5/3) silty clay; moderate, medium, subangular blocky structure breaks to moderate, fine, angular blocky structure; firm when moist, slightly sticky when wet; very strongly acid; clear, smooth boundary.

B22t—11 to 16 inches, dark yellowish-brown (10YR 4/4) silty clay; moderate, fine and medium, subangular blocky structure breaks to moderate, very fine, angular blocky structure; very firm when moist, sticky when wet; strongly acid; clear, smooth boundary.

B23t—16 to 27 inches, finely mixed dark yellowish-brown (10YR 4/4) and brown (10YR 5/3) silty clay; weak, fine and medium, subangular blocky structure breaks to weak, fine, angular blocky structure; very firm when moist, sticky when wet; medium acid; clear, wavy boundary.

B3—27 to 38 inches, grayish-brown (10YR 5/2) silty clay; many, fine, distinct mottles of dark yellowish brown (10YR 4/4) and yellowish brown (10YR 5/6); weak, fine and very fine, angular blocky structure; very firm when moist, sticky when wet; many very fine iron-manganese concretions; moderately alkaline; clear, wavy boundary.

C1—38 to 51 inches, grayish-brown (10YR 5/2) silty clay; many, medium, distinct mottles of dark yellowish brown (10YR 4/4); massive; very firm; few, medium, white, soft lime concretions; strongly alkaline; clear, wavy boundary.

C2—51 to 60 inches +, grayish-brown (10YR 5/2) stratified loam and silty clay loam; common, medium, distinct mottles of dark brown (7.5YR 4/4); massive; friable to firm; strongly alkaline.

In less severely eroded areas, there is a silt loam A horizon. This horizon is dark grayish brown (10YR 4/2) in color, has granular structure, is friable, and is from 6 to 18 inches thick. In places the upper part of the B horizon is silty clay loam.

Millbrook Series

The Millbrook series consists of somewhat poorly drained soils that formed in medium-textured alluvium over stratified sediments. These materials were deposited by either the Ohio River or the Mississippi, or by both. The Millbrook soils are on level or nearly level very low terraces, west and south of Horseshoe Lake. The native vegetation consisted of grasses and scattered trees.

Representative profile of Millbrook silt loam, in a cultivated field, Alexander County, SE¼SE¼NE¼ sec. 5, T. 17 S., R. 2 W.; 230 feet west of road intersection, 45 feet north of road.

Ap—0 to 7 inches, very dark grayish-brown (10YR 3/2) silt loam; weak, fine, granular structure; friable; slightly acid; abrupt, smooth boundary.

A1—7 to 9 inches, very dark brown (10YR 2/2) silt loam; weak, fine, granular structure; friable; slightly acid; clear, smooth boundary.

A2—9 to 19 inches, dark grayish-brown (10YR 4/2) silt loam to loam; few, fine, faint mottles of brown (10YR 5/3); very weak, medium, platy structure; friable; slightly acid; clear, wavy boundary.

B2t—19 to 29 inches, yellowish-brown (10YR 5/4) silty clay loam; common, fine, distinct mottles of grayish brown to light grayish brown (10YR 5/2 to 6/2), and few, fine, faint mottles of yellowish brown (10YR 5/8); weak, medium to coarse, subangular blocky structure; discontinuous, medium, thick, dark-gray (10YR 4/1) clay films; slightly acid; clear, wavy boundary.

B3—29 to 41 inches, grayish-brown to light grayish-brown (10YR 5/2 to 6/2) silty clay loam to clay loam; common, fine, distinct mottles of yellowish brown (10YR 5/6 and 5/8); weak, coarse, subangular blocky structure; few, small, thin, dark-gray (10YR 4/1) clay films; friable to firm; slightly acid; clear, wavy boundary.

C—41 to 52 inches, mottled grayish-brown (10YR 5/2) and yellowish-brown (10YR 5/4) loam to fine sandy loam; massive; friable; slightly acid.

The color of the surface horizon ranges from black (10YR 2/1) to very dark grayish brown (10YR 3/2), and the texture is silt loam or loam. The A2 horizon ranges from silt loam to fine sandy loam. The underlying stratified material ranges from silty clay to loamy fine sand in texture. The strata vary considerably in thickness. The reaction ranges from medium acid to mildly alkaline, and the A horizon is likely to be less acid than the B horizon.

Muren Series

The Muren series consists of moderately well drained soils that formed in loess. The loess generally is more than 20 feet thick on ridgetops but is considerably thinner on side slopes. The Muren soils are on ridgetops, on valley slopes and spurs, and on the lower part of hillsides. The native vegetation was a deciduous forest, consisting mainly of oak, hickory, maple, and elm.

Representative profile of a Muren soil, severely eroded, in a pasture, Alexander County, SE¼NW¼NE¼ sec. 29, T. 14 S., R. 2 W.; 410 feet east of large mulberry tree, in middle of the south slope of a draw, 75 feet south of a gully in the draw.

Ap—0 to 4 inches, yellowish-brown (10YR 5/4) light silty clay loam; moderate, thick, platy structure breaks to weak, fine and very fine, subangular blocky structure; firm; strongly acid; clear, smooth boundary.

B21t—4 to 9 inches, yellowish-brown (10YR 5/4) silty clay loam; few, medium, distinct mottles of light brownish gray (10YR 6/2), and few, medium, prominent mottles of yellowish red (5YR 5/6); moderate, medium, subangular blocky structure; firm; brown (7.5YR 4/4) clay films on surface of peds; strongly acid; clear, smooth boundary.

B22t—9 to 16 inches, brown (7.5YR 5/4) silty clay loam; few, medium, distinct mottles of light brownish gray (10YR 6/2), and few, medium, prominent mottles of yellowish red (5YR 5/6); moderate to strong, medium, subangular blocky structure; firm; medium reddish-brown (5YR 4/4) clay films on surface of peds; strongly acid; clear, smooth boundary.

B23t—16 to 25 inches, dark-brown to brown (7.5YR 4/4) light silty clay loam; common, medium, distinct mottles that are brown (10YR 5/3) when moist and light gray (10YR 7/2) when dry, and few, medium, prominent mottles of yellowish red (5YR 4/6); weak to moderate, medium and coarse, subangular blocky structure; firm; slightly fragile; medium, continuous, reddish-brown (5YR 4/4) clay films on ped surfaces; root channels filled with reddish brown (5YR 4/4); very strongly acid; gradual, smooth boundary.

B31t—25 to 34 inches, dark-brown to brown (7.5YR 4/4) heavy silt loam; common, medium, distinct mottles that are grayish brown (10YR 5/2) when moist and light gray (10YR 7/2) when dry, and common, medium, prominent mottles of reddish brown (5YR 3/4); weak, coarse, angular blocky structure; firm; slightly fragile; peds coated with brown (7.5YR 4/4) clay films and thin smears of black (10YR 2/1) manganese; many

fine pores; few very dark brown (10YR 2/2) iron-manganese concretions; strongly acid; gradual, smooth boundary.

B32—34 to 44 inches, dark-brown to brown (7.5YR 4/4) silt loam; common, medium, distinct mottles of grayish brown (2.5Y 5/2); weak, coarse, angular blocky structure; firm; peds coated with thin, discontinuous, dark-brown (7.5YR 3/2) clay films; root channels lined with black (10YR 2/1) manganese coats; few black (10YR 2/1) manganese concretions; medium acid; gradual, smooth boundary.

B33—44 to 50 inches, dark-brown to brown (10YR 4/3) silt loam; common, medium, prominent mottles of grayish brown (2.5Y 5/2); very weak, coarse, angular blocky structure to massive; firm; peds have thin discontinuous films of dark-brown (7.5YR 3/2) clay, thin continuous coats of black (10YR 2/1) manganese, or thin coats of grayish-brown (2.5Y 5/2) silt; root channels lined with black (10YR 2/1) manganese coats; few black iron-manganese concretions; medium acid; gradual, smooth boundary.

C—50 to 72 inches +, dark yellowish-brown (10YR 4/4) silt loam; common, fine, prominent mottles of light brownish gray (10YR 6/2), and few, fine, faint mottles of dark yellowish brown (10YR 3/4); massive; friable; some thin black (10YR 2/1) manganese stains; slightly acid, becoming neutral with depth.

In uneroded areas there generally is a silt loam A horizon. In these areas the A1 horizon or the plow layer is dark grayish brown (10YR 4/2), and the A2 horizon is dark yellowish brown (10YR 4/3 to 4/4). The silt loam A horizon has moderate, granular structure and is friable.

Newart Series

The Newart series consists of moderately dark colored, somewhat poorly drained soils that formed in 30 to 50 inches of silt loam sediments over sandy sediments. These soils are on level to gently sloping bottom lands along the Mississippi River. The native vegetation consisted of deciduous bottom-land hardwoods, mainly maple, cottonwood, and sycamore.

Representative profile of Newart silt loam, in a cultivated field, Alexander County, SW¼SE¼SW¼ sec. 9, T. 17 S., R. 2 W.; 200 feet north of REA pole, east of old house.

Ap—0 to 7 inches, very dark gray (10YR 3/1) silt loam; massive; friable; slightly acid; abrupt, smooth boundary.

A1—7 to 19 inches, very dark grayish-brown (10YR 3/2) silt loam; few, fine, distinct mottles of brown (10YR 5/3); moderate, fine and medium, granular structure; friable; mildly alkaline; gradual, smooth boundary.

B—19 to 38 inches, dark grayish-brown (10YR 4/2) silt loam; common, fine and medium, distinct mottles of pale brown (10YR 6/3); moderate, coarse, subangular blocky structure; friable; common worm holes and fine pores; mildly alkaline; gradual, wavy boundary.

IIC1—38 to 42 inches, dark grayish-brown (10YR 4/2) loam to fine sandy loam; few, fine, distinct mottles of light brownish gray (10YR 6/2) and yellowish brown (10YR 5/6); few, medium-sized, dark-brown (10YR 3/3) pockets of silt loam; massive; friable; mildly alkaline; gradual, wavy boundary.

IIC2—42 to 58 inches, finely mixed light brownish-gray (10YR 6/2) and yellowish-brown (10YR 5/4) fine sandy loam; few, fine, faint mottles of yellowish brown (10YR 5/6); common, fine, grayish-brown (10YR 4/2 and 5/2) streaks of silt loam; friable; mildly alkaline; clear boundary.

IIIC3—58 to 70 inches +, dark grayish-brown (10YR 4/2) silty clay loam; few, fine, distinct mottles of dark yellowish brown (10YR 4/4) and yellowish brown (10YR 5/6); grayish-brown (10YR 5/2) ped faces; weak, fine, angular blocky structure; firm; moderately alkaline.

The texture of the sandy material in the lower part of the profile ranges from fine sandy loam to fine sand. Typically, this material is 2 feet or more thick. In Alexander County, however, the Mississippi bottom lands are extremely variable. Consequently, the areas mapped as Newart soils contain many inclusions. Such an inclusion is the layer of silty clay loam at a depth of 58 inches. In some profiles the entire solum is formed in medium-textured material. The reaction ranges from slightly acid to mildly alkaline.

Okaw Series

The Okaw series consists of poorly drained soils that formed in medium-textured or moderately fine textured materials over very fine textured alluvial sediments generally several feet thick. These soils are principally on low, level terraces along Cache River. The native vegetation was a deciduous forest, consisting mainly of pin oak and hickory.

Representative profile of Okaw silt loam, in a cultivated field, Alexander County, SE¼NE¼SE¼ sec. 13, T. 15 S., R. 2 W.; 150 feet north of REA pole, 200 feet east of centerline of Illinois route 127.

Ap—0 to 6 inches, dark grayish-brown (10YR 4/2) silt loam; moderate, fine, granular structure; friable; strongly acid; abrupt, smooth boundary.

A2—6 to 12 inches, grayish-brown (10YR 5/2) silt loam; few, fine, distinct mottles of light gray (10YR 7/2); very weak, medium, platy structure; friable; few fine iron-manganese concretions; very strongly acid; abrupt, slightly wavy boundary.

B2tg—12 to 25 inches, grayish-brown (2.5Y 5/2) silty clay; few, fine, distinct mottles of yellowish brown (10YR 5/6); very weak, medium, subangular and angular blocky structure breaks to weak, fine, angular blocky structure; very firm when moist, plastic when wet; very strongly acid; clear, wavy boundary.

B3g—25 to 40 inches, grayish-brown (10YR 5/2) silty clay; common, medium, prominent mottles of strong brown (7.5YR 5/6); weak, fine, angular blocky structure; very firm when moist, plastic when wet; very strongly acid; clear, wavy boundary.

Cg—40 to 52 inches +, grayish-brown (10YR 5/2) silty clay; common, medium, distinct mottles of dark yellowish brown (10YR 4/4); massive; firm; extremely acid.

The thickness of the silt loam A horizon ranges from 6 to about 24 inches. In some places there is a silty clay loam B1 horizon, but in most places there is an abrupt texture change from silt loam to silty clay from the A horizon to the B horizon. Normally, the substratum of silty clay or clay is several feet thick, but in some areas it is underlain by medium-textured or moderately fine textured strata below a depth of 50 inches.

Also mapped is a silty clay loam type. In this soil, the Ap or A1 horizon of silty clay loam is 3 to 8 inches thick and is underlain by a silty clay loam A2 horizon that is 10 to 15 inches thick. In places the A1 horizon is silt loam and is between 1 and 4 inches thick. Where cultivation has mixed this material with the underlying finer textured material, the Ap horizon is heavy silt loam or light silty clay loam.

In some unplowed areas, there is a silt loam A1 horizon 1 to 4 inches thick. Where cultivation has mixed this layer with the underlying finer textured material, there is a heavy silt loam or light silty clay loam Ap horizon. In most areas the substratum is silty clay or clay and is several feet thick, but in some areas there are stratified coarser textured layers below a depth of 50 inches.

Petrolia Series

The Petrolia series consists of poorly drained or very poorly drained, slightly acid or neutral, light-colored soils. These soils formed in silty clay loam sediments that are more than 40 inches thick. They occur in low level areas and depressions, principally adjacent to the Cache River. The native vegetation was a deciduous forest, consisting mainly of pin oak, tupelo-gum, and cottonwood.

Representative profile of Petrolia silty clay loam, in a wet forested area, Alexander County, SE¼NW¼NW¼ sec. 7, T. 15 S., R. 1 W.; 100 feet southeast of edge of woods, 4 feet south of edge of creek.

A1—0 to 7 inches, grayish-brown (10YR 5/2) silty clay loam; moderate, fine and medium, distinct mottles of yellowish brown (10YR 5/4 and 5/6), and few, fine, faint mottles of dark gray (10YR 4/1); strong, very fine and fine, angular blocky structure; friable to firm; medium acid; clear, smooth boundary.

B21g—7 to 19 inches, dark-gray (10YR 4/1) silty clay loam; mixed, numerous, very fine mottles of gray (10YR 5/1 and 6/1) and yellowish brown (10YR 5/4 and 5/6); strong, medium and coarse, subangular blocky structure; firm; dark-gray (10YR 4/1) and gray (10YR 5/1) ped faces; common worm channels; slightly acid; abrupt, smooth boundary.

B22g—19 to 23 inches, gray (10YR 6/1) silty clay loam; many, fine and medium, distinct mottles and streaks of yellowish brown (10YR 5/6 and 5/4); weak, medium and coarse, subangular blocky structure breaks to very weak, fine, angular blocky structure; friable; slightly acid; abrupt, smooth boundary.

B3g—23 to 34 inches, gray (2.5Y 5/1) silty clay loam; common, fine, distinct mottles of light olive brown (2.5Y 5/4 and 5/6); weak, very fine, angular blocky structure; firm; neutral; clear, smooth boundary.

C1g—34 to 42 inches, gray (2.5Y 5/1) silty clay loam; common to many, distinct mottles of light olive brown (2.5Y 5/4); massive; firm; neutral; clear, smooth boundary.

C2g—42 to 50 inches, gray (2.5Y 5/1) silty clay; common, fine, distinct mottles of olive brown (2.5Y 4/4), and few, fine, distinct mottles of very dark grayish brown (2.5Y 3/2); massive; firm when moist, plastic when wet; slightly acid.

The chroma of the B horizon ranges from 2 in the better drained areas to 0 in the ponded areas. In most places the substratum is a thick layer of silty clay loam, but in some places there are stratified materials of other textures below a depth of 40 to 50 inches.

Piopolis Series

The Piopolis series consists of poorly drained or very poorly drained, acid, light-colored soils. These soils formed in medium acid to very strongly acid silty clay loam sediments that are more than 40 inches thick. They occur in low level areas, in depressions, and in long narrow sloughs. The native vegetation was a deciduous forest, consisting mainly of pin oak, tupelo-gum, and cottonwood.

Representative profile of Piopolis silty clay loam, cleared for cultivation, Pulaski County, NE¼NW¼SE¼ sec. 23, T. 16 S., R. 1 W.; 55 feet west of field lane, 10 feet north of edge of field.

A1—0 to 7 inches, grayish-brown (10YR 5/2) silty clay loam; common, medium, distinct mottles of strong brown (7.5YR 5/6) and yellowish brown (10YR 5/4); moderate, medium, subangular blocky structure breaks to moderate, very fine and fine, angular blocky structure; firm; common worm casts; few, medium, distinct, very dark grayish-brown (10YR 3/2) iron-manganese stains; medium acid; clear, smooth boundary.

B21g—7 to 16 inches, gray (10YR 6/1) silty clay loam; many, fine and medium, distinct mottles of strong brown (7.5YR 5/6) and dark yellowish brown (10YR 4/4); moderate, medium and coarse, subangular blocky structure; firm; fine iron-manganese concretions are common; common krotovinas; gray (10YR 5/1) ped faces; medium acid; clear, irregular boundary.

B22g—16 to 24 inches, mixed gray (10YR 6/1) and light-gray (10YR 7/2) silty clay loam; many, medium and coarse, distinct mottles of strong brown (7.5YR 5/6) and yellowish brown (10YR 5/4); weak, medium, prismatic structure breaks to moderate, medium, subangular blocky structure; firm; common krotovinas filled with gray (10YR 5/1) silty clay loam; thick, patchy, light brownish-gray (10YR 6/2) silt or clay films on peds, on worm channels, and on krotovinas; fine soft iron-manganese concretions are common; strongly acid; gradual, wavy boundary.

B3g—24 to 44 inches, gray (10YR 6/1) heavy silty clay loam; many, medium and coarse, distinct mottles of pale brown (10YR 6/3) and strong brown (7.5YR 5/6); very weak, medium, prismatic structure breaks to very weak, fine, angular blocky structure; firm; fine iron-manganese concretions are common; few krotovinas filled with gray (10YR 5/1) silty clay loam; strongly acid; gradual boundary.

C—44 to 61 inches +, gray (10YR 5/1) light silty clay; many, medium and coarse, distinct mottles of dark yellowish brown (10YR 4/4) and strong brown (10YR 5/6); massive; firm; fine iron-manganese concretions are common; strongly acid.

The A horizon ranges from about 5 inches to 15 inches in thickness and from silty clay loam to heavy silt loam in texture. The colors of the A and B horizons have hues of 10YR or 2.5Y, values of 4 to 6, and chromas of 1 or 2. The C horizon is silty clay loam or silty clay. The reaction ranges from medium acid to very strongly acid.

Racoon Series

The Racoon series consists of poorly drained soils that have a thick A horizon. These soils formed in medium-textured alluvium on low level terraces along the Cache River. The native vegetation was a deciduous forest, consisting mainly of pin oak, hickory, and cottonwood.

Representative profile of Racoon silt loam, in a fence row, Alexander County, NE¼SE¼SE¼ sec. 33, T. 15 S., R. 2 W.; south bank of drainage ditch, 20 feet west of road ditch.

A1—0 to 6 inches, dark grayish-brown (10YR 4/2) and grayish-brown (10YR 5/2) silt loam; weak, fine, granular structure; friable; medium acid; clear, smooth boundary.

A21—6 to 16 inches, grayish-brown (10YR 5/2) silt loam; common, medium, distinct mottles of yellowish brown (10YR 5/5); very weak, medium, platy structure; friable; strongly acid; clear, smooth boundary.

A22—16 to 28 inches, grayish-brown (10YR 5/2) silt loam; few, fine, distinct mottles of dark yellowish brown (10YR 4/5); massive; friable; strongly acid; clear, wavy boundary.

B2tg—28 to 40 inches, gray (10YR 5/1) silty clay loam; few, fine, distinct mottles of yellowish brown (10YR 5/6); moderately thick, dark-gray (10YR 4/1) clay films on peds; moderate, medium, subangular blocky structure; firm; strongly acid; clear, wavy boundary.

B3tg—40 to 50 inches, gray (10YR 5/1) silty clay loam; common, fine, distinct mottles of dark yellowish brown (10YR 4/6); weak, medium, subangular to angular blocky structure; firm; strongly acid; clear, wavy boundary.

C1g—50 to 60 inches, gray (10YR 5/1) silty clay loam to clay loam; common, fine, distinct mottles of dark yellowish brown (10YR 4/6); massive; friable when moist, sticky when wet; strongly acid.

C2g—60 to 80 inches +, silty clay; firm; slightly acid.

The A horizon ranges from 24 inches to about 36 inches in thickness. The B horizon ranges from weakly developed to strongly developed. The degree of development of the B horizon is indicated by its thickness, which ranges from 10 inches to more than 20 inches; by its texture, which ranges from light silty clay loam to light silty clay; and by its structure, which ranges from very weak to strong. In some areas this soil contains a considerable amount of sand, and the underlying material is likely to be stratified, with materials ranging from loamy fine sand to silty clay.

Riley Series

The Riley series consists of moderately dark colored, somewhat poorly drained soils that formed in 15 to 30 inches of silty clay loam sediments over sandy sediments. These soils are on level to gently sloping bottom lands of the Mississippi River. The native vegetation consisted of deciduous hardwoods, mainly pecan, sycamore, cottonwood, and maple.

Representative profile of Riley silty clay loam, in a cultivated field, Alexander County, SW¼NW¼NE¼ sec. 16, T. 17 S., R. 2 W., 200 feet south of large hackberry tree, east side of field, 275 feet east of lane.

Ap—0 to 5 inches, very dark grayish-brown (10YR 3/2) silty clay loam; moderate, fine and medium, granular structure; slightly firm; many worm holes and casts; neutral; abrupt, smooth boundary.

A1—5 to 15 inches, very dark gray (10YR 3/1) silty clay loam; strong, medium and coarse, angular blocklike clods (plowpan); firm; few worm holes and casts; mildly alkaline; clear, smooth boundary.

B—15 to 24 inches, brown (10YR 5/3) silt loam to loam; many, medium, faint mottles of pale brown (10YR 6/3); very weak, fine, subangular blocky structure; friable; many worm holes, and medium, faint, grayish-brown (10YR 5/2) worm casts; moderately alkaline; abrupt, smooth boundary.

IIC1—24 to 42 inches, light brownish-gray (2.5Y 6/2) fine sandy loam; massive, but stratified in very thin layers, less than 1 millimeter thick; friable; few worm holes, and few, medium, faint, grayish-brown (10YR 5/2) worm casts; moderately alkaline; clear, smooth boundary.

IIC2—42 to 70 inches +, stratified loam, silt loam, and very fine sandy loam, in layers 2 to 8 inches thick; the loam and silt loam are mixed grayish brown (2.5Y 5/2) and dark grayish brown (2.5Y 4/2) with few, fine, faint mottles of olive brown (2.5Y 5/4); the very fine sandy loam is light brownish gray (2.5Y 6/2) with very few, fine, faint mottles of olive brown (2.5Y 5/4); massive; friable; the silt loam has a few worm casts; moderately alkaline, weakly effervescent.

The thickness of the silty clay loam ranges from 15 to 30 inches. The texture of the sandy material ranges from fine sandy loam to sand. In Alexander County, the sandy material includes some very fine sandy loam. In many places there is a silt loam or loam layer, 2 to 15 inches thick, between the silty clay loam and the sandy material. In some places stratified layers of finer textured material occur below the sandy stratum. The reaction ranges from slightly acid to moderately alkaline.

Roby Series

The Roby series consists of somewhat poorly drained soils that formed in sandy alluvium deposited by the Ohio River. These soils are in level areas and on low ridges or terraces. The native vegetation was a deciduous forest, consisting mainly of oak, hickory, sycamore, and maple.

Representative profile of Roby fine sandy loam, in a cultivated field, Pulaski County, SW¼NE¼SW¼ sec. 3, T. 15 S., R. 1 W.

Ap—0 to 7 inches, dark grayish-brown (10YR 3/2 to 4/2) fine sandy loam; very weak, medium, granular structure; very friable; slightly acid; abrupt, smooth boundary.

A2—7 to 18 inches, grayish-brown (10YR 5/2) to brown (10YR 5/3) fine sandy loam; many, fine, distinct mottles of yellowish brown (10YR 5/5), and few, medium, distinct mottles of dark grayish brown (10YR 4/2); weak, medium, granular structure; numerous worm casts; very friable; common fine pores; medium acid; clear, smooth boundary.

B2t—18 to 30 inches, brown (10YR 5/3) loam to sandy clay loam; few, medium, faint mottles of grayish brown (10YR 5/2), and many, medium, distinct mottles of dark yellowish brown (10YR 4/4); very weak, coarse, subangular blocky structure; friable; few fine pores; few very fine iron-manganese concretions; slightly acid; clear, wavy boundary.

C1—30 to 40 inches, light brownish-gray (10YR 6/2) fine sandy loam; many, medium and coarse, distinct mottles of dark yellowish brown (10YR 4/4), and few, medium, distinct mottles of yellowish brown (10YR 5/6); single grain; very friable; slightly acid; clear, wavy boundary.

C2—40 to 53 inches, grayish-brown (10YR 5/2) loam; common, fine, distinct mottles of dark yellowish brown (10YR 4/6); friable; strongly acid; gradual, wavy boundary.

C3—53 to 56 inches +, silty clay loam; firm; strongly acid.

The surface horizon ranges from very fine sandy loam to fine sandy loam in texture. The texture of the B horizon ranges from loam to silty clay loam but generally is sandy clay loam. The degree of development of the B horizon is associated with the texture. The coarser textured B horizon is thinner and has weaker structure; the finer textured B horizon is thicker and has stronger structure. In some places the C horizon consists of a thick layer of fine sandy loam or loamy fine sand, and in others it consists of stratified materials ranging from loamy fine sand to silty clay. The reaction ranges from slightly acid to strongly acid.

Ruark Series

The Ruark series consists of poorly drained soils that formed in sandy sediments deposited by the Ohio River. These soils are on low level terraces along the Cache River, principally between Ullin and Olive Branch. The native vegetation was a deciduous forest, consisting mainly of pin oak and hickory.

Representative profile of Ruark fine sandy loam, in a cultivated field, Alexander County, NW¼SE¼SE¼ sec. 24, T. 15 S., R. 2 W.; 125 feet south of REA pole, 15 feet west of fence.

Ap—0 to 7 inches, grayish-brown (10YR 5/2) fine sandy loam; common, fine, distinct mottles of yellowish brown (10YR 5/4); very weak, medium, granular structure to massive; friable; strongly acid; abrupt, smooth boundary.

A2—7 to 18 inches, light brownish-gray (10YR 6/2) fine sandy loam; common, medium, distinct mottles of brownish yellow (10YR 6/6); massive; friable; very strongly acid; smooth boundary.

B1—18 to 20 inches, gray (10YR 5/1) loam; few, fine, distinct mottles of yellowish brown (10YR 5/6); very weak, coarse, subangular blocky structure; friable; very strongly acid; clear, smooth boundary.

B2tg—20 to 33 inches, gray (10YR 5/1) clay loam; common, medium, faint mottles of light gray (10YR 7/2), and common, fine and medium, distinct mottles of brownish yellow (10YR 6/6) and yellowish brown (10YR 5/8); very weak, medium, prismatic structure that breaks to

weak, coarse, subangular blocky structure; friable; very strongly acid; gradual, smooth boundary.

B3g—33 to 37 inches, light-gray (10YR 6/1) sandy clay loam to loam; common, fine, faint mottles of grayish brown (10YR 5/2), and common, medium, distinct mottles of yellowish brown (10YR 5/6 and 5/8); very weak, coarse, subangular blocky structure; friable; strongly acid; clear, smooth boundary.

C1—37 to 44 inches, light-gray (10YR 6/1) sandy clay loam to loam; common, fine, distinct mottles of yellowish brown (10YR 5/6 and 5/8), and common, fine and medium, black iron-manganese stains; massive; friable; fine and medium iron-manganese concretions are common; slightly acid; clear boundary.

C2—44 to 52 inches, light brownish-gray (10YR 6/2) fine sandy loam to loam; common, fine, distinct mottles of yellowish brown (10YR 5/6); massive; friable; neutral.

The B horizon ranges from heavy loam to clay loam in texture. The underlying material ranges from thick layers of loamy fine sand to stratified layers of fine sandy loam, clay loam, and silty clay. The reaction ranges from very strongly acid to strongly acid.

Sarpy Series

The Sarpy series consists of light-colored, well-drained to excessively drained soils that formed in alkaline loamy sand and sandy sediments. These soils are adjacent to the Mississippi River. The native vegetation consisted of a sparse cover of grasses or trees.

Representative profile of Sarpy loamy fine sand, in a cultivated field, Alexander County, NW¼NE¼SE¼ sec. 24, T. 14 S., R. 4 W.; 25 feet west of road, 50 feet south of lane.

A1—0 to 10 inches, dark-brown (10YR 4/3) loamy fine sand to very fine sand; single grain; friable; mildly alkaline; weakly effervescent; abrupt, wavy boundary.

C1—10 to 30 inches, yellowish-brown (10YR 5/4) loamy fine sand to fine sand, very faintly banded; single grain; friable to loose; strongly effervescent; diffuse boundary.

C2—30 to 67 inches +, yellowish-brown (10YR 5/4) loamy fine sand to fine sand; lenses of loamy fine sand, 2 to 6 inches thick, 6 to 12 inches apart; single grain; loose; strongly effervescent.

The texture of the solum is loamy fine sand, loamy very fine sand, or fine sand, or it contains lenses or bands of loamy fine sand and fine sand. An Ap or an A1 horizon, less than 10 inches thick, of fine sandy loam occurs in a few places. The sand may be very fine, fine, medium, or coarse. The reaction is neutral to strongly alkaline.

Sciotoville Series

The Sciotoville series consists of moderately well drained soils that formed in medium-textured alluvium deposited by the Ohio River. These soils are in level areas and on short gentle to steep slopes of low terraces along the Cache and Ohio Rivers. The native vegetation was a deciduous forest, consisting mainly of oak, sweetgum, walnut, and maple.

Representative profile of Sciotoville silt loam, on a roadside, Pulaski County, SE¼SE¼NW¼ sec. 10, T. 14 S., R. 1 E.; west road bank, 90 feet north of an REA lead-in pole to farm house.

A1—0 to 8 inches, dark-brown (10YR 4/3) silt loam; moderate, very fine and fine, granular structure; friable; mildly alkaline; clear, smooth boundary.

A2—8 to 13 inches, brown (7.5YR 4/4) silt loam; moderate, fine and medium, granular structure; friable; very slightly sticky when wet; numerous worm casts; slightly acid; clear, smooth boundary.

B21t—13 to 19 inches, yellowish-brown (10YR 5/4) silty clay loam; moderate, fine and medium, subangular blocky structure; friable; very slightly sticky when wet; strongly acid; clear, wavy boundary.

B22t—19 to 23 inches, yellowish-brown (10YR 5/4) silty clay loam; few, fine, faint mottles of strong brown (7.5YR 5/6); moderate, fine and medium, subangular blocky structure; firm; brown (10YR 5/3) silica coats on peds; very strongly acid; clear, wavy boundary.

B23t—23 to 29 inches, brown (10YR 5/3) light silty clay loam; common, fine, prominent mottles of yellowish red (5YR 5/8); weak to moderate, medium, subangular blocky structure; slightly firm; strongly acid; clear, wavy boundary.

B3—29 to 34 inches, pale-brown (10YR 6/3) sandy clay loam; common, fine, prominent mottles of yellowish red (5YR 5/8); very weak, medium, prismatic structure; slightly firm; strongly acid; gradual boundary.

C—34 to 80 inches +, pale-brown (10YR 6/3) silt loam, stratified with loam, sandy loam, and clay loam; yellowish-red (5YR 5/8) mottles; massive; strongly acid.

The texture of the B horizon ranges from light silty clay loam to heavy silty clay loam. In some areas the solum contains a considerable amount of sand, and in most areas it contains a noticeable amount of mica. The underlying material ranges from fine loamy sand to light silty clay and generally is stratified. The reaction is typically strongly acid or very strongly acid, but in places the substratum is neutral in reaction. In some places a weakly developed to moderately well developed fragipan is evident at a depth of about 25 inches.

Sharon Series

The Sharon series consists of moderately well drained or well drained, light-colored soils that formed in acid silt loam sediments derived primarily from nearby loess-covered uplands. These soils occur mainly on small and medium-sized bottom lands. The native vegetation was a deciduous forest, consisting principally of white oak, hickory, walnut, and red gum.

Representative profile of Sharon silt loam, in a cultivated field, Pulaski County; SW¼SW¼NE¼ sec. 19, T. 15 S., R. 1 E.; 1/8 mile north of road, 6 feet south of old fence row, midway between creek and drainage ditch.

Ap—0 to 5 inches, yellowish-brown (10YR 5/4) silt loam; weak, medium, granular structure; friable; strongly acid; clear, smooth boundary.

A1—5 to 11 inches, brown (10YR 4/3) silt loam; structure masked by abundant worm casts, which give it moderate, medium, granular appearance; friable; common very fine pores, and few fine pores; strongly acid; gradual, smooth boundary.

C1—11 to 24 inches, dark yellowish-brown (10YR 3/4) silt loam; massive; friable; many worm casts and channels in upper 8 inches; common to many, very fine and fine pores; medium acid; clear, smooth boundary.

C2—24 to 52 inches, yellowish-brown (10YR 5/4) silt loam; common, fine and medium, distinct mottles of pale brown (10YR 6/3) and light yellowish brown (10YR 6/4); few, medium, distinct, grayish-brown (10YR 5/2) iron stains; massive; friable; very fine pores; few fine iron concretions; strongly acid; clear, smooth boundary.

C3—52 to 58 inches +, light-gray (10YR 7/1) and light brownish-gray (10YR 6/2) silt loam; common mottles of medium brown (10YR 4/3) and yellowish brown (10YR 5/8 and 5/6); massive; friable; common, medium, soft iron concretions; strongly acid.

The reaction ranges to very strongly acid, but in most places it is medium acid.

Stookey Series

The Stookey series consists of well-drained soils that formed in loess. The loess ranges from 20 to 40 feet in thickness on ridges but is considerably thinner on steep slopes. Generally, the loess overlies chert bedrock, but in some local areas it overlies limestone, and in an area near Fayville, the loess overlies Coastal Plain gravel. The Stookey soils developed under a deciduous forest, consisting mainly of oak, hickory, beech, maple, sweetgum, and tulip-poplar.

Representative profile of Stookey silt loam, in a forested area, Alexander County, NW¼NE¼NE¼ sec. 25, T. 15 S., R. 3 W.; on abandoned road, 200 yards east of gravel road, and 15 yards south, down the slope.

A1—0 to 3 inches, very dark grayish-brown (10YR 3/2) silt loam; moderate, fine, crumb structure and moderate, medium and coarse, granular structure; friable; slightly acid; abrupt, wavy boundary.

A2—3 to 6 inches, yellowish-brown (10YR 5/4) and dark grayish-brown (10YR 4/2) silt loam; very weak, thin, platy structure; friable; very strongly acid; abrupt, smooth boundary.

A3—6 to 9 inches, mixed dark yellowish-brown (10YR 4/4) and dark grayish-brown (10YR 4/2) silt loam; weak, medium, subangular blocky structure; friable; very strongly acid; clear, smooth boundary.

B1—9 to 13 inches, mixed dark yellowish-brown (10YR 4/4) and strong-brown (7.5YR 5/6) silt loam; weak to moderate, medium, subangular blocky structure; friable; strongly acid; clear, wavy boundary.

B21—13 to 19 inches, strong-brown (7.5YR 5/6) silt loam; moderate, fine and medium, subangular blocky structure; friable; strongly acid; gradual, smooth boundary.

B22—19 to 30 inches, strong-brown (7.5YR 4/6) to yellowish-red (5YR 4/6) heavy silt loam; weak to moderate, coarse, subangular blocky structure; slightly firm; medium acid; gradual, smooth boundary.

C—30 to 50 inches +, strong-brown (7.5YR 5/6) silt loam; massive; friable when moist, hard when dry; medium acid.

The B horizon ranges from light silt loam to heavy silt loam. The hue of the B horizon normally is 7.5YR but ranges from 10YR to 5YR.

Stoy Series

The Stoy series consists of somewhat poorly drained soils. These soils formed in loess, ordinarily more than 50 inches thick and in many places 180 to 200 inches thick. The loess generally is leached to a depth of 50 inches or more. The Stoy soils occur in broad, level or slightly sloping areas and on short side slopes along drainageways. The native vegetation was a deciduous forest, consisting mainly of oak and hickory.

Representative profile of Stoy silt loam, in a cultivated field, NE¼NW¼SE¼ sec. 7, T. 15 S., R. 2 E.; 200 feet west of house, 40 feet south of pecan tree.

A1—0 to 11 inches, dark grayish-brown (10YR 4/2) silt loam; few, fine, distinct mottles of gray (10YR 5/1); weak, fine, granular structure; friable; medium acid; few iron-manganese concretions; clear, smooth boundary.

A2—11 to 17 inches, yellowish-brown (10YR 5/4) silt loam; weak, thick, platy structure; friable; medium acid; clear, smooth boundary.

A3—17 to 21 inches, yellowish-brown (10YR 5/4) silt loam; common, fine, distinct mottles of gray (10YR 6/1); weak, medium, subangular blocky structure; friable; medium acid; clear, smooth boundary.

B1—21 to 23 inches, mixed light-gray (10YR 7/2) and yellowish-brown (10YR 5/4) heavy silt loam; dark-red (2.5YR 3/6) stains; weak, medium and fine, subangular blocky structure; slightly firm; strongly acid; clear, smooth boundary.

B2t—23 to 40 inches, grayish-brown (2.5Y 5/2) silty clay loam; common, medium, prominent mottles of strong brown (7.5YR 5/6); moderate, medium, prismatic structure breaks to strong, coarse, angular blocky structure; firm when moist, hard when dry; very strongly acid; grayish-brown (2.5Y 5/2) silica coats on ped faces; gradual boundary.

C—40 to 50 inches, gray (10YR 6/1) silt loam; common, medium, prominent mottles of strong brown (7.5YR 4/6); massive; friable; strongly acid.

In most areas the A1 horizon is thinner than the A1 horizon in the profile described, and in many places it has been incorporated into an Ap horizon. Some Stoy soils that are within 2 miles of the Ohio River are less well developed than is typical for the series. In these, the subsoil is thinner, is less well developed, and has light silty clay loam texture.

Tice Series

The Tice series consists of somewhat poorly drained, moderately dark colored soils that formed in silty clay loam sediments more than 50 inches thick. These soils are in broad level areas and on gently sloping or moderately sloping ridges. The native vegetation was a deciduous forest, consisting mainly of sycamore, cottonwood, silver maple, sweetgum, swamp white oak, and black walnut.

Representative profile of Tice silty clay loam, in a cultivated field, SE¼SE¼NW¼ sec. 10, T. 17 S., R. 2 W.; on north side of field boundary, 210 feet east of road.

Ap—0 to 7 inches, very dark grayish-brown (10YR 3/2) silty clay loam; weak, medium, subangular blocky structure breaks to weak, fine, angular blocky structure; firm; moderately alkaline; abrupt, wavy boundary.

A1—7 to 10 inches, mixed dark grayish-brown (10YR 4/2) heavy silt loam and very dark gray (10YR 3/1) silty clay loam; silt loam in discontinuous, weak, thin plates or strata; silty clay loam has weak, fine, subangular blocky structure; firm; moderately alkaline; abrupt, wavy boundary.

B1—10 to 20 inches, very dark grayish-brown (10YR 3/2) silty clay loam; weak to moderate, fine and medium, subangular and angular blocky structure; firm; very dark gray (10YR 3/1) ped faces, and few medium-brown (7.5YR 4/4) stains; moderately alkaline; abrupt, smooth boundary.

B21—20 to 25 inches, mixed dark-gray (10YR 4/1) to very dark grayish-brown (10YR 3/2) silty clay loam; few fine mottles of dark yellowish brown (10YR 4/4); weak, fine, subangular blocky structure; friable to firm; moderately alkaline; abrupt, smooth boundary.

B22—25 to 42 inches, very dark grayish-brown (10YR 3/2) heavy silty clay loam; moderate, medium, prismatic structure breaks to moderate, fine, angular blocky structure; firm; dark-gray (10YR 4/1) ped faces, and few fine mottles of dark yellowish brown (10YR 4/4); moderately alkaline; clear, smooth boundary.

BC—42 to 44 inches, mixed silt loam from horizon below, and silty clay loam from horizon above; the silty clay loam occurs as tongues and balls in the silt loam.

C—44 to 55 inches, mixed gray (10YR 4/1), very dark grayish-brown (10YR 3/2), and dark yellowish-brown (10YR 4/4) silt loam; massive; friable; few fine iron-manganese concretions; mildly alkaline.

The very dark grayish-brown surface horizon generally is 10 to 20 inches thick. Fine sandy loam material is common below a depth of 50 inches. In places thin strata of silt loam or loam occur at a depth of less than 40 inches. The reaction ranges from slightly acid to moderately alkaline. In many places structure is weak or lacking below a depth

of 24 inches. In a few areas the Tice soils are underlain by silty clay.

Wakeland Series

The Wakeland series consists of somewhat poorly drained, light-colored soils that formed in slightly acid to neutral silt loam sediments derived mainly from very thick loessal deposits on nearby uplands. These soils occur as small to large bottom lands. The native vegetation was a deciduous forest, consisting mainly of maple, red oak, swamp white oak, sycamore, and hickory.

Representative profile of Wakeland silt loam, in a cultivated field, Alexander County, SW¼SW¼NE¼ sec. 26, T. 14 S., R. 3 W.; 110 feet east of field gate, 30 feet north of fence.

Ap—0 to 7 inches, brown (10YR 5/3 and 4/3) silt loam; weak, fine, granular structure; friable; slightly acid; abrupt, wavy boundary.

C1—7 to 19 inches, brown (10YR 4/3) silt loam; few, fine, distinct mottles of grayish brown (10YR 5/2) and light brownish gray (10YR 6/2), and few, fine, distinct yellowish-brown (10YR 5/6 and 5/8) iron stains; weak, thin, platy structure or stratified; friable, slightly compact in place; many very fine pores; slightly acid; clear, wavy boundary.

C2—19 to 35 inches, brown (10YR 4/3) silt loam; common, fine, faint mottles of grayish brown (10YR 5/2), and few, fine, distinct mottles of yellowish brown (10YR 5/4, 5/6 and 5/8); fine platelike strata with dark grayish-brown (10YR 4/2) coats, and few, fine, distinct, dark-brown (10YR 3/3) iron stains on plates; friable, slightly compact in place; medium acid; clear, wavy boundary.

C3—35 to 50 inches +, brown (10YR 4/3) silt loam; few, fine, distinct mottles of yellowish brown (10YR 5/6 and 5/8), and few, fine, faint mottles of pale brown (10YR 6/3); massive; friable; dark grayish-brown (10YR 4/2) coats and worm casts; slightly acid.

The surface horizon normally is free of mottles to a depth of 8 to 20 inches. The texture of the silt tends to be coarse, and in some places the texture approaches very fine sand. In many places chert occurs in the soil material.

Ware Series

The Ware series consists of moderately dark colored, moderately well drained or well drained soils that formed in 10 to 30 inches of silt loam sediments over sandy sediments. These sediments were deposited by the Mississippi River. The Ware soils are on low ridges and in level areas. The native vegetation consisted of deciduous hardwoods, mainly cottonwood, sycamore, and maple.

Representative profile of Ware silt loam, in a cultivated field, Alexander County, SE¼NE¼NE¼ sec. 12, T. 14 S., R. 3 W.; 180 feet south of REA pole, 90 feet north of telephone pole, 30 feet east of centerline of road.

Ap—0 to 7 inches, very dark grayish-brown (10YR 3/2) silt loam; moderate, fine, granular structure; friable; mildly alkaline; abrupt, smooth boundary.

A1—7 to 12 inches, very dark grayish-brown (10YR 3/2) silt loam; weak, moderate, subangular blocky structure; friable to firm; neutral; clear, wavy boundary.

B—12 to 23 inches, yellowish-brown (10YR 5/4) loam; very weak, medium, subangular blocky structure; friable; common small worm holes filled with very dark grayish-brown (10YR 3/2) silt loam; neutral; gradual, wavy boundary.

HC—23 to 73 inches, mixed brown (10YR 5/3) and pale-brown (10YR 6/3) fine sandy loam to loamy fine sand; single grain; loose; neutral.

The silt loam ranges from 10 to 30 inches in thickness. In the lower part of the profile, the texture ranges from very fine sandy loam to sand. In many places there is a layer of loam, 2 to 15 inches thick, between the silty layer and the sandy layer. In some places stratified layers of finer textured material occur below the sandy layer. The reaction ranges from slightly acid to moderately alkaline.

Weinbach Series

The Weinbach series consists of somewhat poorly drained soils that formed in medium-textured acid alluvium underlain by stratified sandy and clayey materials high in content of mica. These soils are on nearly level to moderately sloping low terraces. The native vegetation was a deciduous forest, consisting mainly of oak and hickory.

Representative profile of Weinbach silt loam, Pulaski County, NE¼NE¼SW¼ sec. 10, T. 14 S., R. 1 E.; near center of low ridge, halfway between two houses; in ditch on west side of road.

A1—0 to 8 inches, dark grayish-brown (10YR 4/2) silt loam; weak, fine, granular structure; friable; few fine oxide concretions; slightly acid; abrupt, smooth boundary.

A2—8 to 10 inches, light brownish-gray (10YR 6/2) silt loam; common, medium, faint mottles of grayish brown (10YR 5/2); very weak, thin, platy structure breaks to weak, fine, granular structure; friable; few fine oxide concretions; very strongly acid; abrupt, smooth boundary.

B1—10 to 14 inches, pale-brown (10YR 6/3) heavy silt loam to light silty clay loam; few, fine, distinct mottles of yellowish brown (10YR 5/5); moderate, fine and medium, subangular blocky structure breaks to weak, fine, granular structure; slightly firm; common fine oxide concretions, very strongly acid; gradual boundary.

B2t—14 to 32 inches, pale-brown (10YR 6/3) and yellowish-brown (10YR 5/4) heavy silty clay loam to light silty clay; weak, fine, prismatic structure breaks to weak, very fine and fine, subangular blocky structure; plastic; very firm when moist, slightly sticky when wet; light brownish-gray (10YR 6/2) ped faces; extremely acid; gradual boundary.

B3—32 to 42 inches, grayish-brown (10YR 5/2) and light brownish-gray (10YR 6/2) heavy silty clay loam; weak, very fine and fine, subangular blocky structure; very firm when moist, nonsticky when wet; extremely acid; gradual boundary.

C—42 to 44 inches +, dark yellowish-brown (10YR 4/4) and grayish-brown (10YR 5/2) silty clay loam; massive; firm when moist, nonsticky when wet; few fine pockets of white powdery crystals; extremely acid.

The A horizon ranges from 3 to 16 inches in thickness, depending on the steepness of the slope and the degree of erosion. The subsoil ranges from silty clay loam to light silty clay in texture. The content of sand varies throughout the profile. In places there is a very weak fragipan below a depth of 30 inches.

Weir Series

The Weir series consists of poorly drained soils that formed in loess, which in most areas is from 80 to 200 inches thick. These soils are in level or nearly level areas, on uplands. The native vegetation was a deciduous forest, consisting mainly of post oak and hickory.

Representative profile of Weir silt loam, in a cultivated field, Pulaski County, SW¼SE¼NW¼ sec. 7, T. 15 S., R. 2 E.; 100 feet north of oak tree.

Ap—0 to 9 inches, dark grayish-brown (10YR 4/2) silt loam; weak, medium, granular structure; friable; neutral; abrupt, smooth boundary.

A2—9 to 16 inches, light brownish-gray (10YR 6/2) silt loam; common, medium, distinct mottles of reddish brown (5YR 4/3); weak, medium, platy structure; friable; strongly acid; clear, smooth boundary.

B1—16 to 21 inches, grayish-brown (10YR 5/2) silty clay loam; common, fine, distinct mottles of olive brown (2.5Y 4/4); weak, medium, angular blocky structure; friable; many iron-manganese concretions; very strongly acid; clear, smooth boundary.

B2tg—21 to 32 inches, grayish-brown (2.5Y 5/2) silty clay loam; common, fine, distinct mottles of light olive brown (2.5Y 5/5); weak, medium, angular blocky structure; firm; many iron-manganese concretions; very strongly acid; clear, smooth boundary.

B3g—32 to 45 inches, grayish-brown (2.5Y 5/2) light silty clay loam; many, fine, distinct mottles of light olive brown (2.5Y 5/5); weak, coarse, angular blocky structure; firm; many iron-manganese concretions; medium acid.

In most places the A horizon is between 15 and 20 inches in thickness. The B horizon ranges from 20 to 40 inches in thickness. The matrix color of the B horizon has hues of 10YR or 2.5Y, values ranging from 4 to 6, and chromas of 1 or 2. The B horizon generally has prismatic structure. The reaction ranges from medium acid to very strongly acid.

WHEELING SERIES

The Wheeling series consists of well-drained soils that formed in medium-textured alluvium deposited by the Ohio River. These soils are in level areas and on short, gentle to steep slopes of low terraces along the Cache and Ohio Rivers. The native vegetation was a deciduous forest, consisting mainly of oak, ash, tulip-poplar, sweetgum, and maple.

Representative profile of Wheeling silt loam, in cultivated field, Pulaski County, SE¼NE¼NW¼ sec. 18, T. 14 S., R. 1 E.; 70 feet south of gravel road, 20 feet west of lane.

Ap—0 to 8 inches, dark grayish-brown (10YR 4/2) silt loam; moderate, medium and coarse, granular structure; friable; mildly alkaline; abrupt, smooth boundary.

A2—8 to 10 inches, dark yellowish-brown (10YR 4/4) silt loam; very weak, medium, granular structure; friable; slightly acid; clear, smooth boundary.

B21t—10 to 27 inches, dark yellowish-brown (10YR 4/4) silty clay loam; strong, fine and medium, subangular blocky structure; slightly firm; very strongly acid; gradual, smooth boundary.

B22t—27 to 45 inches, dark yellowish-brown (10YR 4/4) silty clay loam; dark yellowish-brown (10YR 3/4) discontinuous ped coats; strong, medium and coarse, subangular blocky structure; slightly firm; very strongly acid; clear, smooth boundary.

B3—45 to 50 inches, dark yellowish-brown (10YR 4/4) light silty clay loam; few, fine, distinct mottles of strong brown (7.5YR 5/6 and 5/8); weak, medium and coarse, subangular blocky structure; friable; very strongly acid; clear, smooth boundary.

C—50 to 55 inches +, strong-brown (7.5YR 5/6) loamy fine sand; single grain; very friable; very strongly acid.

The texture of the B horizon ranges from light silty clay loam to heavy silty clay loam. In some areas the solum contains a considerable amount of sand, and in most areas it contains a noticeable amount of mica. The substratum generally is somewhat coarse textured, but it ranges from silty clay loam to loamy fine sand. In many places it is stratified. The reaction typically is strongly acid to very strongly acid, but in some places the substratum is neutral.

Laboratory Data on Selected Soil Profiles

Physical and chemical laboratory data considered representative of selected soils in Pulaski and Alexander Counties are given in table 10. The soils sampled are those of the Alford, Alvin, and Hosmer series. Profiles of these soils are described in the section "Formation, Morphology, and Classification of Soils."

The data in table 10 are useful to soil scientists in classifying soils and in developing concepts of soil genesis. This information is helpful for estimating fertility, tilth, and other properties that affect soil management, and it also serves as a check against field estimates and determinations.

Field and laboratory methods

The samples used to determine the data in table 10 were collected from carefully selected pits. All laboratory analyses were made on ovendry material that passed the 2-millimeter sieve.

The Alvin and Hosmer soils were tested at the Soil Survey Laboratory at Beltsville, Md. The Alford soil was tested at the Soil Survey Laboratory at Lincoln, Nebr. Standard methods were used.

Determinations of clay were made by the pipette method (*17, 18*). The reaction of the saturated paste was measured with a glass electrode. Organic carbon was determined by wet combustion, using a modification of the Walkley-Black method (*20*). The cation-exchange capacity was determined by direct distallation of adsorbed ammonia (*20*). To determine extractable calcium and magnesium, calcium was separated as calcium oxalate, and magnesium as magnesium ammonium phosphate (*20*). Extractable potassium was determined on original extract with a flame spectrophotometer.

General Nature of the Counties

Alexander County was established in 1819, and Pulaski County in 1843. Most of the early settlers came from the Southern States. According to the U.S. Census, in 1960 the two counties had a total population of 26,551.

In addition to agriculture, the basic enterprises include forestry, the manufacture of wood products, and the mining of tripoli (silica), fuller's earth, clay, limestone, and sand and gravel (*4*). The excellent water transportation, adequate railroad connections, good highway system, ample water supply, adequate labor supply, and nearness to the Illinois and Kentucky coal fields could support considerably higher industrial development.

Physical features and geology

Pulaski and Alexander Counties are located at the southern tip of Illinois, at the junction of the Ohio and the Mississippi Rivers. This area has a variety of landforms and relief.

A large part of both counties consists of alluvial plains and terraces bordering the Mississippi, Ohio, and Cache Rivers.

TABLE 10.—*Chemical and physical properties of selected soils*

Soil type and sample location	Horizon	Depth	pH	Organic carbon [1]	Exchangeable cations [2] (meq./100 gm. of soil)			Cation-exchange capacity	Base saturation	Particle-size distribution		
					Ca	Mg	K			Sand (2 to 0.05 mm.)	Silt (0.05 to 0.002 mm.)	Clay (<0.002 mm.)
		In.	*1:1*	*Pct.*				*Meq./100 gm.*	*Pct.*	*Pct.*	*Pct.*	*Pct.*
Alford silt loam,	Ap	0 to 5	6. 5	1. 00	7. 4	0. 8	0. 2	10. 0	84	2. 4	84. 7	12. 9
SE¼NW¼NE¼ sec.	B1	5 to 10	6. 0	. 41	6. 3	1. 2	. 2	11. 2	69	2. 2	80. 1	17. 7
29, T. 14 S., R. 2 W.	B21	10 to 18	6. 0	. 25	8. 5	3. 5	. 3	16. 9	73	2. 1	72. 2	25. 8
(Alexander County).	B22	18 to 30	5. 4	. 18	8. 2	4. 9	. 4	19. 6	69	2. 1	70. 0	27. 9
	B23	30 to 43	4. 8	. 14	6. 0	4. 2	. 3	19. 2	55	1. 9	72. 9	25. 2
	B31	43 to 55	4. 7	. 10	5. 1	3. 6	. 3	17. 7	51	1. 9	75. 1	23. 0
	B32	55 to 68	4. 7	. 06	5. 0	3. 5	. 3	17. 2	52	1. 9	76. 6	21. 5
	B33	68 to 82	4. 8	. 06	5. 7	3. 9	. 3	19. 2	53	2. 2	76. 4	21. 4
	C	82 to 92	4. 7	. 05	6. 0	3. 6	. 3	18. 2	55	1. 9	77. 7	20. 4
Alvin fine sandy loam,	Ap	0 to 6	7. 0	. 22	3. 3	. 1	. 1	8. 8	40	53. 5	39. 7	6. 8
SW¼SW¼SE¼ sec.	A2	6 to 13	7. 0	. 18	1. 2	. 4	. 2	11. 4	17	51. 3	38. 5	10. 2
35, T. 15 S., R. 2 W.	B1	13 to 19	6. 4	. 14	5. 4	2. 5	. 3	19. 0	43	51. 2	26. 3	22. 5
(Alexander County).	B21	19 to 24	5. 0	. 15	6. 2	3. 3	. 3	21. 0	47	50. 8	23. 2	26. 0
	B22	24 to 30	4. 5	. 09	3. 8	2. 7	. 3	20. 3	33	41. 6	34. 2	24. 2
	B23	30 to 35	4. 8	. 06	2. 7	. 8	. 3	16. 6	23	41. 1	39. 6	19. 3
	B24	35 to 41	4. 4	. 07	2. 6	1. 9	. 3	12. 0	40	63. 3	19. 8	16. 9
	C1	41 to 48	4. 5	. 04	1. 6	1. 0	. 1	5. 4	50	90. 4	5. 1	4. 5
	C2	48 to 55	4. 6	. 04	2. 5	1. 1	. 2	6. 8	55	89. 2	2. 1	8. 7
Hosmer silt loam [3]	A2	2 to 11	4. 9	. 68	1. 5	1. 6	. 3	11. 4	31	2. 0	82. 6	15. 4
SW¼NE¼NE¼ sec.	B2t	17 to 22	4. 7	. 22	2. 1	3. 9	. 4	17. 3	37	1. 6	74. 0	24. 4
16, T. 15 S., R. 1 E.	B2t	22 to 27	4. 7	. 15	2. 8	4. 6	. 3	19. 9	39	1. 5	72. 7	25. 8
(Pulaski County).	A'2	27 to 31	4. 7	. 12	3. 4	4. 7	. 3	21. 1	40	1. 8	72. 2	26. 0
	B'2tx	35 to 39	4. 7	. 07	4. 3	5. 4	. 3	20. 8	50	1. 3	74. 6	24. 1
	B'3x	44 to 52	4. 8	. 05	5. 9	6. 5	. 3	21. 3	62	2. 1	75. 3	22. 4

[1] The percentage of organic carbon times 1.724 equals the percentage of organic matter.

[2] One milliequivalent of calcium (Ca) per 100 grams of soil equals 400 pounds per acre or per 2 million pounds of soil material; one milliequivalent of magnesium (Mg) per 100 grams of soil equals 240 pounds per acre or per 2 million pounds of soil material; one milliequivalent of potassium (K) per 100 grams of soil equals 780 pounds per acre or per 2 million pounds of soil material.

[3] Only the horizons sampled and tested are shown.

The uplands of Pulaski County and the southern tip of the uplands of Alexander County form an area of gently rolling hills and knobs that are covered with a moderately thick to thick mantle of loess. The elevation ranges from about 340 to 450 feet. This area is underlain by unconsolidated sand, gravel, and clay of the Coastal Plain province (*19*), the northernmost extension of the Gulf of Mexico embayment during Cretaceous and Tertiary times.

The uplands in the northwestern part of Alexander County constitute the most rugged area in the two counties. In this area are relatively narrow ridgetops and steep-sided rocky valley walls. The ridgetops commonly have an elevation of more than 700 feet, and local relief ranges from 150 to 300 feet.

The northeastern part of Alexander County is in the Shawnee section of the Interior Low Plateau province. This area is underlain largely by limestone. A thick mantle of loess covers the ridgetops, and generally a much thinner mantle covers the steep side slopes. In places there are outcrops of rock.

The remaining and larger part of the uplands of Alexander County is in the Salem Plateau section of the Ozark Plateau province. This area consists of relatively pure chert beds and some local areas of cherty limestone, overlain by thick deposits of loess. In many places erosion has exposed the underlying rock.

Several important changes in the course of the Mississippi and Ohio Rivers in this region date back to the Pleistocene or glacial era (*28*). Geological evidence indicates that the silting of the original Mississippi valley by sediment-laden glacial melt water caused the river to cut the 6½-mile Thebes-Commerce gorge and to enter the large Ohio valley northwest and west of Cairo.

During at least a part of the glacial age, the Ohio River flowed more or less from east to west from Golconda, Ill., to the northern part of Pulaski County and then southwestward through the valley now occupied by the Cache River. The present Ohio River valley along the southern part of Pulaski County was originally the Tennessee River valley until the silting of the older Ohio valley caused the Ohio River to cut through and divide east of Paducah, Ky., and to claim the lower Tennessee valley. During the glacial age the older Ohio valley was an important source of loess, and at present the loess in this area is thicker than along the present Ohio valley in the southern part of Illinois.

All of Pulaski County and the northeastern part of Alexander County drain to the Ohio River, principally through the Cache River. The western part and most of the southern part of Alexander County drain directly to the Mississippi.

Ground-water supplies in Pulaski and Alexander Coun-

ties vary from good or excellent on bottom lands and terraces, where aquifers of sand and gravel occur at various depths, to poor on the uplands in the northwestern part of Alexander County, where consolidated chert and limestone bedrock occur (*21*). The uplands of Pulaski County, which are underlain by Coastal Plain sediments, are rated as fair to good as possible sources of ground water, and the aquifers are more scattered and discontinuous than on bottom lands and terraces.

Climate [10]

Pulaski and Alexander Counties have the continental climate typical of southern Illinois. Temperatures of 100° F. or higher occur during nearly half the summers. Below-zero temperatures occur about once in 5 years in the southern part of the two-county area and more than twice that often in the northern part. Maximum temperatures are similar throughout both counties, but minimum temperatures average about 4 or 5 degrees lower in the northern part. Low-pressure areas, or storm centers, and the associated weather fronts bring frequent changes in temperature, humidity, cloudiness, and wind direction during much of the year, although such changes are considerably less frequent in summer.

Table 11 gives the average monthly and yearly temperatures and precipitation at Cairo, Ill., as well as the probabilities of receiving specified amounts of precipitation 1 year in 10. Table 12 gives figures that indicate, for the period March 1 through November 21, the chances of receiving specified amounts of precipitation during 1-week and 2-week periods.

The annual precipitation averages slightly more than 45 inches but has varied from less than 30 inches to more than 70 inches. Precipitation is fairly uniformly distributed throughout the year. The variation is about 3 inches for months having the lowest average to about 4½ inches for those having the highest average.

In July and August, the average precipitation is between 3 and 3½ inches per month. Major droughts are infrequent, but rather prolonged dry periods during part of the growing season are not unusual. These dry periods can result in a reduction in yields of such summer crops as corn and soybeans.

Precipitation in summer occurs mostly as showers of brief duration or as brief thunderstorms. A single thunderstorm often produces more than an inch of rain and occasionally is accompanied by hail and damaging winds. More than 7½ inches of rain has fallen within a 24-hour period, and more than 15 inches has fallen during a month. Thunderstorms occur on about 50 days each year; less than half occur during the critical growing period.

Hailstorms occur only about once in 2 years during the summer months (*13*). On an average, two hailstorms occur each year from April through September. Not all hailstorms have stones of sufficient size or quantity to cause extensive crop damage.

During an average winter, there will be about 15 days when the ground is covered with 1 inch or more of snow. The average annual snowfall is about 9 inches, but a third of the winters will have less than 5 inches.

Winter months are the cloudiest, with only about 45 percent of possible sunshine in January. From June through October, sunshine increases to an average of 75 percent of the possible, the maximum of near 80 percent occurring in August.

Temperatures of 100° or higher have occurred only during the months of June, July, August, and September. July normally is the warmest month, with an average maximum temperature of about 90°.

[10] By WILLIAM L. DENMARK, ESSA Weather Bureau climatologist for Illinois, Department of Commerce.

TABLE 11.—*Temperature and precipitation at Cairo, Ill.*

Month	Temperature				Precipitation			
	Average daily maximum [1 2]	Average daily minimum [1 2]	Record highest [3]	Record lowest [3]	Average total [2]	1 year in 10 will have— Less than— [4]	1 year in 10 will have— More than— [4]	Average snowfall [5]
	°F.	°F.	°F.	°F.	In.	In.	In.	In.
January	45	30	75	—16	4. 46	0. 9	8. 2	2. 7
February	49	33	78	—14	3. 67	1. 4	6. 5	2. 0
March	57	39	88	6	4. 79	1. 7	7. 8	2. 1
April	69	50	89	24	4. 07	1. 7	6. 3	(6)
May	79	59	98	37	4. 39	1. 8	8. 9	0
June	88	68	104	46	4. 13	1. 2	8. 1	0
July	90	72	106	54	3. 19	1. 2	5. 4	0
August	89	71	106	50	3. 10	0. 8	6. 0	0
September	82	63	104	36	3. 01	1. 2	6. 3	0
October	72	52	93	24	2. 88	1. 0	5. 0	0
November	56	40	82	5	3. 87	1. 4	7. 8	0. 5
December	46	33	74	—7	3. 67	1. 4	5. 9	1. 6
Year	69	51	106	—16	45. 23	31. 7	60. 6	8. 9

[1] Average daily temperature for any month is the average of the average daily maximum and average daily minimum.
[2] Based on 30-year record.
[3] Based on 89-year record.
[4] Based on 40-year record.
[5] Based on 21-year record.
[6] Trace.

January normally is the coldest month. Although there are days in February when the temperature falls as low as it does in January, the cold spells generally are shorter.

In Pulaski and Alexander Counties the period between the last freezing temperature in spring and the first freezing temperature in fall is approximately 208 days but is somewhat longer in the vicinity of Cairo. This period is called the growing season, but this term is somewhat misleading since crops differ in tolerance for cold temperatures. Table 13 indicates the probability of the occurrence of several different threshold temperatures. Temperatures can vary widely between ridges and valleys during radiation freezes, the type most common in Illinois.

TABLE 12.—*Chances of receiving a specified amount of precipitation during a specified period at Pulaski and Alexander Counties, Ill.* (*3*)

Period	During 1 week-period				During 2-week period		
	Trace or less	0. 40 inch or more	1 inch or more	2 inches or more	Trace or less	1 inch or more	2 inches or more
	Percent	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*
March 1–7	9	61	32	10	1	70	38
March 8–14	8	64	39	17			
March 15–21	12	64	38	16	3	72	43
March 22–28	6	70	41	16			
March 29–April 4	9	64	39	17	1	75	48
April 5–11	6	73	47	22			
April 12–18	9	62	44	20	0	64	38
April 19–25	9	57	34	9			
April 26–May 2	11	74	41	21	1	76	46
May 3–9	9	67	38	14			
May 10–16	7	66	41	20	2	69	42
May 17–23	12	65	36	13			
May 24–30	17	54	28	9	3	62	33
May 31–June 6	14	64	38	15			
June 7–13	19	60	39	19	3	61	37
June 14–20	19	55	32	13			
June 21–27	14	60	33	12	3	66	35
June 28–July 4	19	59	33	13			
July 5–11	16	46	22	8	3	52	25
July 12–18	17	50	25	11			
July 19–25	22	50	24	7	1	50	23
July 26–August 1	22	49	25	9			
August 2–8	16	52	28	10	3	58	32
August 9–15	11	57	34	15			
August 16–22	17	55	33	15	7	56	32
August 23–29	25	53	29	11			
August 30–September 5	14	55	32	13	5	57	29
September 6–12	29	46	25	10			
September 13–19	29	49	30	13	6	55	32
September 20–26	24	51	32	15			
September 27–October 3	34	49	31	15	11	55	31
October 4–10	25	49	28	12			
October 11–17	36	41	24	11	14	49	27
October 18–24	30	54	31	10			
October 25–31	25	52	31	13	8	61	35
November 1–7	26	57	35	15			
November 8–14	21	54	26	7	4	59	32
November 15–21	23	56	35	16			

TABLE 13.—*Probability of freezing temperatures in spring and in fall* (*16*)

[All freeze data are based on temperatures taken at a standard U.S. Weather Bureau shelter approximately 5 feet above the ground and in a representative location. At times the temperature is colder nearer the ground or in local areas subject to extreme air drainage]

Probability	Dates for given probability and temperature				
	32° F.	*28° F.*	*24° F.*	*20° F.*	*16° F.*
Last in spring:					
Average date	April 5	March 21	March 10	February 28	February 18
25 percent chance after	April 14	March 30	March 19	March 9	February 27
10 percent chance after	April 22	April 7	March 27	March 17	March 7
First in fall:					
Average date	October 30	November 14	November 20	December 1	December 11
25 percent chance before	October 21	November 5	November 11	November 22	December 2
10 percent chance before	October 14	October 29	November 4	November 15	November 25

Agriculture

Agriculture is relatively more important in Pulaski County than in Alexander County. The 1959 census shows that in both counties the number of farms has decreased since 1940, whereas the size of farms has gradually increased. Various uses of the land in farms in 1959 are shown in the following list.

Land use	*Pulaski County*	*Alexander County*
	Acres	*Acres*
Corn	14, 293	15, 034
Soybeans	19, 462	15, 100
Wheat	4, 214	4, 239
Oats	705	106
Tame hay	5, 723	3, 163
Woodland	15, 596	21, 155
Pasture	22, 952	16, 159

Following is a list of the number of livestock and chickens on farms in Pulaski and Alexander. Counties in 1959.

Kind of animal	*Pulaski County*	*Alexander County*
Swine	12, 702	7, 471
Sheep	265	218
Dairy cattle	1, 114	321
Beef cattle	7, 874	4, 342
Horses and mules	413	263
Chickens (4 months old and over)	36, 595	16, 628

Literature Cited

(1) American Association of State Highway Officials.
1961. STANDARD SPECIFICATIONS FOR HIGHWAY MATERIALS AND METHODS OF SAMPLING AND TESTING. Ed. 8, 2 pts., illus.

(2) Baldwin, Mark, Kellogg, Charles E., and Thorp, James.
1938. SOIL CLASSIFICATION. U.S. Dept. Agr. Ybk. 1938: 979–1001.

(3) Barger, G. L., Shaw, R. H., and Dale, R. F.
1959. CHANCES OF RECEIVING SELECTED AMOUNTS OF PRECIPITATION IN THE NORTH-CENTRAL REGION OF THE UNITED STATES. Agr. Expt. Sta., Iowa State Univ.

(4) Bitterman, Norman G.
1948. INDUSTRIAL POSSIBILITIES OF SOUTHERN ILLINOIS. Southern Ill. Booklet No. 3, Univ. of Ill.

(5) Boggess, W. R.
1958. GROWTH AND THIRD THINNING YIELDS IN A 21-YEAR-OLD SHORTLEAF PINE PLANTATION IN SOUTHERN ILLINOIS. Ill. Agr. Expt. Sta. Forestry Note 79.

(6) ——— and Gilmore, A. R.
1963. EARLY GROWTH OF LOBLOLLY AND SHORTLEAF PINE AT VARIOUS SPACINGS IN SOUTHERN ILLINOIS. Trans. Ill. Acad. Sci., v. 56: 19–26.

(7) ———, Minckler, L. S., and Gilmore, A. R.
1963. EFFECT OF SITE AND THINNING INTENSITY ON GROWTH AND YIELD OF SHORTLEAF PINE PLANTATIONS IN SOUTHERN ILLINOIS. Ill. Agr. Expt. Sta. Forestry Note 105.

(8) Broadfoot, W. M.
1960. FIELD GUIDE FOR EVALUATING COTTONWOOD SITES. USDA Southern Forest Expt. Sta. Occas. Paper 178.

(9) Fehrenbacher, J. B., and Snider, H. J.
1954. CORN ROOT PENETRATION IN MUSCATINE, ELLIOTT, AND CISNE SOILS. Soil Sci. 77: 281–291.

(10) Gilmore, A. R.
1963. PREDICTING YIELDS OF LOBLOLLY PINE PLANTATIONS IN SOUTHERN ILLINOIS FROM SOIL CHARACTERISTICS. Dept. of Forestry, Univ. of Ill., Forestry Note 101, 11 pp.

(11) Gilmore, A. R.
1963. PREDICTING YIELDS OF SHORTLEAF PINE PLANTATIONS IN SOUTHERN ILLINOIS FROM SOIL AND SITE CHARACTERISTICS. Dept. of Forestry, Univ. of Ill., Forestry Note 106, 7 pp.

(12) Grossman, R. B., Fehrenbacher, J. B., and Beavers, A. H.
1959. FRAGIPAN SOILS OF ILLINOIS: I, II, III. Soil Sci. Soc. Amer. Proc. 23: 65–75.

(13) Huff, F. A., and Changnon, S. A., Jr.
1959. HAIL CLIMATOLOGY OF ILLINOIS. Rpt. of Invest. No. 38, Ill. State Water Survey.

(14) Illinois Technical Forestry Association.
1952. FOREST PLANTING FOR ILLINOIS. Rev. 1957, 35 pp., illus.

(15) ———
1956. RECOMMENDED FOREST PRACTICES FOR ILLINOIS HARDWOOD TIMBER TYPES. Rev. 1957. 16 pp.

(16) Joos, L. A.
1960. FREEZE PROBABILITIES IN ILLINOIS. Ill. Agr. Expt. Sta. in cooperation with U.S. Weather Bur. Bul. 650, 16 pp.

(17) Kilmer, V. J., and Alexander, L. T.
1949. METHODS OF MAKING MECHANICAL ANALYSIS OF SOILS. Soil Sci. 68: 15–24.

(18) ———, and Mullins, J. F.
1954. IMPROVED STIRRING AND PIPETTING APPARATUS FOR MECHANICAL ANALYSIS OF SOILS. Soil Sci. 77: 437–441, illus.

(19) Leighton, M. M., Ekblaw, George E., and Horberg, Leland.
1948. PHYSIOGRAPHIC DIVISIONS OF ILLINOIS. Ill. State Geol. Survey, Rpt. of Invest. No. 129, 33 pp., illus.

(20) Peech, M., Alexander, L. T., Dean, L. A., and Reed, J. F.
1947. METHODS OF SOIL ANALYSIS FOR SOIL-FERTILITY INVESTIGATIONS. U.S. Dept. Agr. Cir. 757, 25 pp.

(21) Pryor, Wayne A.
1956. GROUNDWATER GEOLOGY IN SOUTHERN ILLINOIS. Ill. State Geol. Sur. Cir. 212.

(22) Putnam, J. A., Furnival, G. M., and McKnight, J. S.
1960. MANAGEMENT AND INVENTORY OF SOUTHERN HARDWOODS. USDA Agriculture Handbook 181, 102 pp., illus.

(23) Schnur, G. L.
1937. YIELD, STAND, AND VOLUME TABLES FOR EVEN-AGED UPLAND OAK FORESTS. USDA Tech. Bul. 560, 88 pp., illus.

(24) Simonson, Roy W.
1962. SOIL CLASSIFICATION IN THE UNITED STATES. Science, v. 137, No. 3535, pp. 1027–1034, illus.

(25) Thorp, James, and Smith, Guy D.
1949. HIGHER CATEGORIES OF SOIL CLASSIFICATION: ORDER, SUBORDER, AND GREAT SOIL GROUPS. Soil Sci. 67: 117–126.

(26) University of Illinois.
1962. ILLINOIS SOIL AND WATER CONSERVATION NEEDS INVENTORY. Col. of Agr., Coop. Ext. Serv., 118 pp.

(27) Waterways Experiment Station, Corps of Engineers.
1953. THE UNIFIED SOIL CLASSIFICATION SYSTEM. Tech. Memo. 3–357, v. 1.

(28) Weller, J. Marvin.
1940. GEOLOGY AND OIL POSSIBILITIES OF EXTREME SOUTHERN ILLINOIS. Ill. State Geol. Surv., Rpt. of Invest. No. 71.

(29) Wildlife Management Institute.
1963. RATING NORTHEASTERN SOILS FOR THEIR SUITABILITY FOR WILDLIFE HABITAT. Trans. of the Twenty-Eighth North American Wildlife and Natural Resource Conf., S.C.S., pp. 247–261, illus.

Glossary

Aggregate, soil. Many fine particles held in a single mass or cluster, such as a clod, crumb, block, or prism.

Alluvium. Soil material, such as sand, silt, or clay, that has been deposited on land by streams.

Available moisture capacity. The capacity of a soil to hold water in a form available to plants. Amount of moisture held in soil between field capacity, or about one-third atmosphere of tension, and the wilting coefficient, or about 15 atmospheres of tension.

Base saturation. The degree to which material that has base-exchange properties is saturated with exchangeable cations other than hydrogen, expressed as a percentage of the cation-exchange capacity.

Calcareous soil. A soil containing enough calcium carbonate (often with magnesium carbonate) to effervesce (fizz) visibly when treated with cold, dilute hydrochloric acid.

Clay. As a soil separate, the mineral soil particles less than 0.002 millimeter in diameter. As a soil textural class, soil material that is 40 percent or more clay, less than 45 percent sand, and less than 40 percent silt.

Claypan. A compact, slowly permeable soil horizon that contains more clay than the horizon above and below it. A claypan is commonly hard when dry and is plastic or stiff when wet.

Colluvium. Soil material, rock fragments, or both, moved by creep, slide, or local wash and deposited at the base of steep slopes.

Consistence, soil. The feel of the soil and the ease with which a lump can be crushed by the fingers. Terms commonly used to describe consistence are—

Loose.—Noncoherent; will not hold together in a mass.

Friable.—When moist, crushes easily under gentle pressure between thumb and forefinger and can be pressed together into a lump.

Firm.—When moist, crushes under moderate pressure between thumb and forefinger, but resistance is distinctly noticeable.

Plastic.—When wet, readily deformed by moderate pressure but can be pressed into a lump; will form a "wire" when rolled between thumb and forefinger.

Sticky.—When wet, adheres to other material, and tends to stretch somewhat and pull apart, rather than to pull free from other material.

Hard.—When dry, moderately resistant to pressure; can be broken with difficulty between thumb and forefinger.

Soft.—When dry, breaks into powder or individual grains under very slight pressure.

Cemented.—Hard and brittle; little affected by moistening.

Cover crop. A close-growing crop grown primarily to improve and to protect the soil between periods of regular crop production; or a crop grown between trees and vines in orchards and vineyards.

Diversion. A ridge of earth, generally a terrace, that is built to divert runoff from its natural course and, thus, to protect areas downslope from the effects of such runoff.

Fertility, soil. The quality of a soil that enables it to provide compounds, in adequate amounts and in proper balance, for the growth of specified plants, when other growth factors, such as light, moisture, temperature, and the physical condition (or tilth) of the soil, are favorable.

Fragipan. A loamy, brittle, subsurface horizon that is very low in organic matter and clay but is rich in silt or very fine sand. The layer is seemingly cemented when dry, has a hard or very hard consistence, and has a high bulk density in comparison with the horizon or horizons above it. When moist, the fragipan tends to rupture suddenly if pressure is applied, rather than to deform slowly. The layer is generally mottled, is slowly or very slowly permeable to water, and has few or many bleached fracture planes that form polygons. Fragipans are a few inches to several feet thick; they generally occur below the B horizon, 15 to 40 inches below the surface.

Genesis, soil. The manner in which a soil originated, with special reference to the processes responsible for the development of the solum, or true soil, from the unconsolidated parent material.

Glacial drift. Rock material transported by glacial ice and then deposited; also includes the assorted and unassorted materials deposited by streams flowing from glaciers.

Glacial outwash. Cross-bedded gravel, sand, and silt deposited by melt water as it flowed from glacial ice.

Glacial till. Unassorted, nonstratified glacial drift consisting of clay, silt, sand, and boulders transported and deposited by glacial ice.

Gleization. The reduction, translocation, and segregation of soil compounds, notably of iron, usually in the subsoil or substratum, as a result of poor aeration and drainage; expressed in the soil by mottled colors dominated by gray. The soil-forming processes leading to the development of a gley soil.

Hardpan. A hardened or cemented soil horizon, or layer. The soil material may be sandy or clayey, and it may be cemented by iron oxide, silica, calcium carbonate, or other substance.

Horizon, soil. A layer of soil, approximately parallel to the surface, that has distinct characteristics produced by soil-forming processes. These are the major soil horizons:

A horizon.—The mineral horizon at the surface. It has an accumulation of organic matter, has been leached of soluble minerals and clay, or shows the effects of both.

B horizon.—The horizon in which clay minerals or other material has accumulated, that has developed a characteristic blocky or prismatic structure, or that shows the effects of both processes.

C horizon.—The unconsolidated material immediately under the true soil. In chemical, physical, and mineral composition it is presumed to be similar to the material from which at least part of the overlying solum has developed.

Leached soil. A soil from which most of the soluble materials have been removed from the entire profile or have been removed from one part of the profile and have accumulated in another part.

Loess. A fine-grained eolian deposit consisting dominantly of silt-sized particles.

Medium-textured soil. Soil of very fine sandy loam, loam, silt loam, or silt texture.

Morphology, soil. The makeup of the soil, including the texture, structure, consistence, color, and other physical, mineralogical, and biological properties of the various horizons of the soil profile.

Mottled. Irregularly marked with spots of different colors that vary in number and size. Mottling in soils usually indicates poor aeration and lack of drainage. Descriptive terms are as follows: Abundance—*few, common,* and *many;* size—*fine, medium,* and *coarse;* and contrast—*faint, distinct,* and *prominent.* The size measurements are these: *fine,* less than 5 millimeters (about 0.2 inch) in diameter along the greatest dimension; *medium,* ranging from 5 millimeters to 15 millimeters (about 0.2 to 0.6 inch) in diameter along the greatest dimension; and *coarse,* more than 15 millimeters (about 0.6 inch) in diameter along the greatest dimension.

Natural drainage. Refers to the conditions that existed during the development of the soil, as opposed to altered drainage, which is commonly the result of artificial drainage or irrigation but may be caused by the sudden deepening of channels or the blocking of drainage outlets. Seven different classes of natural drainage are recognized.

Excessively drained soils are commonly very porous and rapidly permeable and have a low water-holding capacity.

Somewhat excessively drained soils are also very permeable and are free from mottling throughout their profile.

Well-drained soils are nearly free from mottling and are commonly of intermediate texture.

Moderately well drained soils commonly have a slowly permeable layer in or immediately beneath the solum. They have uniform color in the A and upper B horizons and have mottling in the lower B and the C horizons.

Imperfectly or somewhat poorly drained soils are wet for significant periods but not all the time, and in podzolic soils commonly have mottlings below 6 to 16 inches in the lower A horizon and in the B and C horizons.

Poorly drained soils are wet for long periods and are light gray and generally mottled from the surface downward, although mottling may be absent or nearly so in some soils.

Very poorly drained soils are wet nearly all the time. They have a dark-gray or black surface layer and are gray or light gray, with or without mottling, in the deeper parts of the profile.

Pan. A layer in a soil that is firmly compacted or very rich in clay. Frequently the word "pan" is combined with other words that more explicitly indicate the nature of the layers; for example, *hardpan, fragipan,* and *claypan.*

Parent material (soil). The horizon of weathered rock or partly weathered soil material from which soil has formed; horizon C in the soil profile.

Permeability. The quality of a soil horizon that enables water or air to move through it. Terms used to describe permeability are as follows: *very slow, slow, moderately slow, moderate, moderately rapid, rapid,* and *very rapid.*

Poorly graded. A soil material consisting mainly of particles of nearly the same size. Because there is little difference in size

of the particles in poorly graded soil material, density can be increased only slightly by compaction.

Reaction, soil. The degree of acidity or alkalinity of a soil, expressed in pH values. A soil that tests to pH 7.0 is precisely neutral in reaction because it is neither acid nor alkaline. An acid, or "sour," soil is one that gives an acid reaction; an alkaline soil is one that is alkaline in reaction. In words, the degrees of acidity or alkalinity are expressed thus:

	pH		*pH*
Extremely acid	Below 4.5	Mildly alkaline	7.4 to 7.8
Very strongly acid	4.5 to 5.0	Moderately alkaline	7.9 to 8.4
Strongly acid	5.1 to 5.5	Strongly alkaline	8.5 to 9.0
Medium acid	5.6 to 6.0	Very strongly alkaline	9.1 and higher
Slightly acid	6.1 to 6.5		
Neutral	6.6 to 7.3		

Relief. The elevations or inequalities of a land surface, considered collectively.

Sand. As a soil separate, individual rock or mineral fragments in soils having diameters ranging from 0.05 to 2.0 millimeters in diameter. Most sand grains consist of quartz, but sand may be any mineral composition. As a textural class, soil material that is 85 percent or more sand and not more than 10 percent clay.

Sedimentary rock. A rock composed of particles deposited from suspension in water. The chief sedimentary rocks are conglomerate, from gravel; sandstone, from sand; shale, from clay; and limestone, from soft masses of calcium carbonate. There are many intermediate types. Some wind-deposited sands have been consolidated into sandstone.

Silt. As a soil separate, individual mineral particles in a soil that range in diameter from the upper limit of clay (0.002 millimeter) to the lower limit of very fine sand (0.05 millimeter). As a textural class, soil material that is 80 percent or more silt and less than 12 percent clay.

Soil. A natural, three-dimensional body on the earth's surface that supports plants and that has properties resulting from the integrated effect of climate and living matter acting upon parent material, as conditioned by relief over periods of time.

Solum. The upper part of a soil profile, above the parent material, in which the processes of soil formation are active. The solum in mature soil includes the A and B horizons. Generally, the characteristics of the material in these horizons are unlike those of the underlying material. The living roots and other plant and animal life characteristic of the soil are largely confined to the solum.

Structure, soil. The arrangement of primary soil particles into compound particles or clusters that are separated from adjoining aggregates and have properties unlike those of an equal mass of unaggregated primary soil particles. The principal forms of soil structure are—*platy* (laminated), *prismatic* (vertical axis of aggregates longer than horizontal), *columnar* (prisms with rounded tops), *blocky* (angular or subangular), and *granular*. *Structureless* soils are (1) *single grain* (each grain by itself, as in dune sand) or (2) *massive* (the particles adhering together without any regular cleavage, as in many claypans and hardpans).

Subsoil. Technically, the B horizon; roughly, the part of the profile below plow depth.

Substratum. Any layer lying beneath the solum, or true soil; the C horizon.

Surface soil. The soil ordinarily moved in tillage, or its equivalent in uncultivated soil, about 5 to 8 inches in thickness. The plowed layer.

Terrace. An embankment, or ridge, constructed across sloping soils on the contour or at a slight angle to the contour. The terrace intercepts surplus runoff so that it may soak into the soil or flow slowly to a prepared outlet without harm. Terraces in fields are generally built so they can be farmed. Terraces intended mainly for drainage have a deep channel that is maintained in permanent sod.

Terrace (geological). An old alluvial plain, ordinarily flat or undulating, bordering a river, a lake, or the sea. Stream terraces are frequently called second bottoms, as contrasted to flood plains and are seldom subject to overflow. Marine terraces were deposited by the sea and are generally wide.

Texture, soil. The relative proportions of sand, silt, and clay particles in a mass of soil. The basic textural classes, in order of increasing proportion of fine particles, are *sand, loamy sand, sandy loam, loam, silt loam, silt, sandy clay loam, clay loam, silty clay loam, sandy clay, silty clay,* and *clay*. The sand, loamy sand, and sandy loam classes may be further divided by specifying "coarse," "fine," or "very fine."

Topsoil. A presumed fertile soil or soil material, ordinarily rich in organic matter, used to topdress roadbanks, lawns, and gardens.

Water table. The highest part of the soil or underlying rock material that is wholly saturated with water. In some places an upper, or perched, water table may be separated from a lower one by a dry zone.

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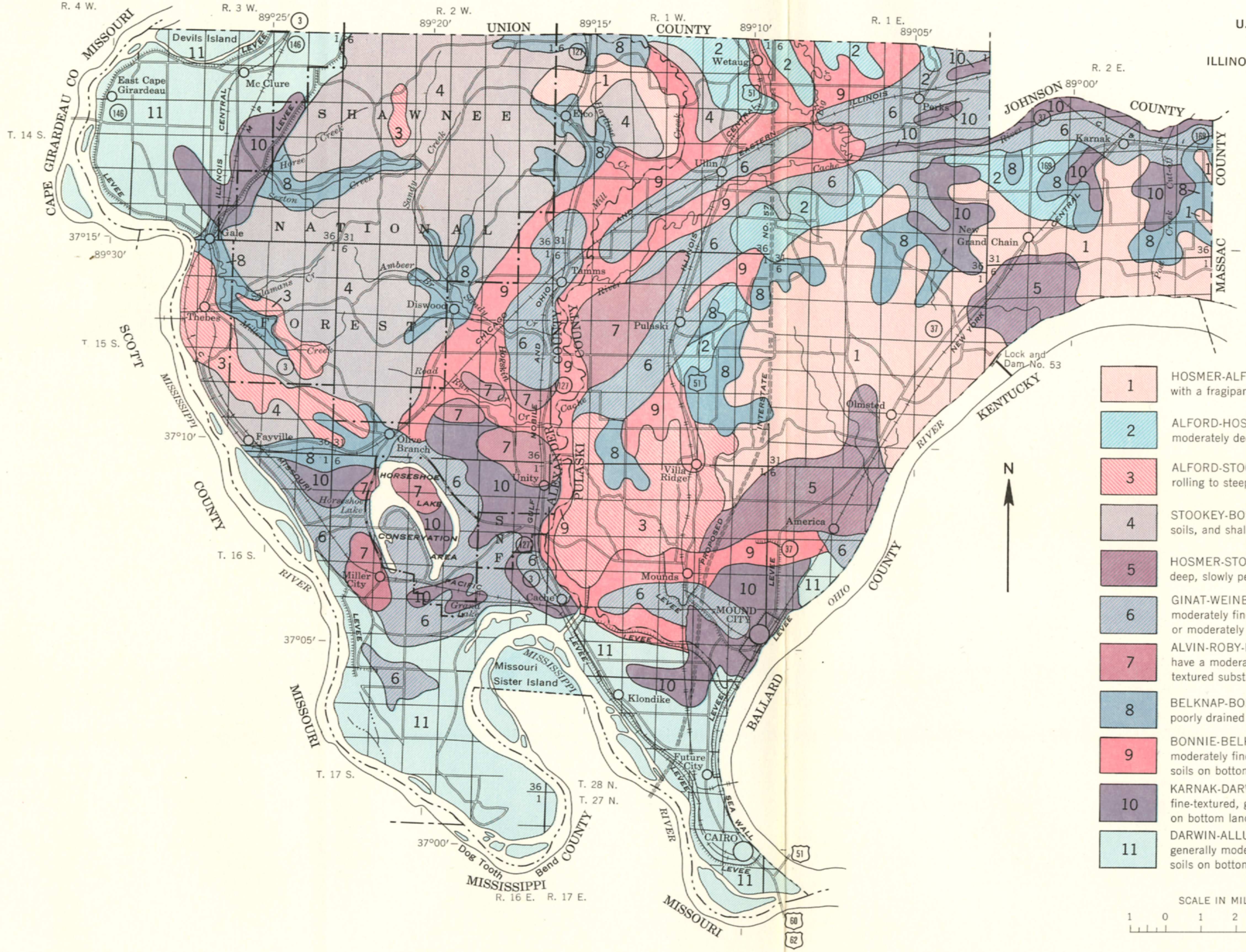
GENERAL SOIL MAP

PULASKI AND ALEXANDER COUNTIES, ILLINOIS

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
ILLINOIS AGRICULTURAL EXPERIMENT STATION



SOIL ASSOCIATIONS

1. HOSMER-ALFORD ASSOCIATION: Moderately deep, slowly permeable soils with a fragipan, and deep, moderately permeable soils; rolling to steep
2. ALFORD-HOSMER ASSOCIATION: Deep, moderately permeable soils, and moderately deep, slowly permeable soils with a fragipan; rolling to steep
3. ALFORD-STOOKEY-MUREN ASSOCIATION: Deep, moderately permeable soils; rolling to steep
4. STOOKEY-BODINE ASSOCIATION: Deep, permeable, generally weakly developed soils, and shallow, cherty soils; steep and very steep
5. HOSMER-STOY ASSOCIATION: Deep, slowly permeable soils, and moderately deep, slowly permeable soils with a fragipan; level to strongly sloping
6. GINAT-WEINBACH-SCIOTOVILLE ASSOCIATION: Deep soils that have a moderately fine textured or fine textured subsoil and a medium-textured or moderately fine textured substratum; level to sloping stream terraces
7. ALVIN-ROBY-RUARK ASSOCIATION: Deep, loamy soils that generally have a moderately fine textured subsoil and a coarse-textured to fine-textured substratum; level to sloping stream terraces
8. BELKNAP-BONNIE-HAYMOND ASSOCIATION: Light-colored, medium-textured, poorly drained to well-drained, strongly acid to slightly acid soils on bottom lands
9. BONNIE-BELKNAP ASSOCIATION: Light-colored, medium-textured and moderately fine textured, poorly drained and very poorly drained, strongly acid soils on bottom lands
10. KARNAK-DARWIN ASSOCIATION: Light-colored and moderately dark colored, fine-textured, generally very poorly drained, slightly acid and medium acid soils on bottom lands
11. DARWIN-ALLUVIAL LAND-RILEY ASSOCIATION: Moderately dark colored, generally moderately fine textured, somewhat poorly drained, nearly neutral soils on bottom lands; underlain in many places by sandy strata

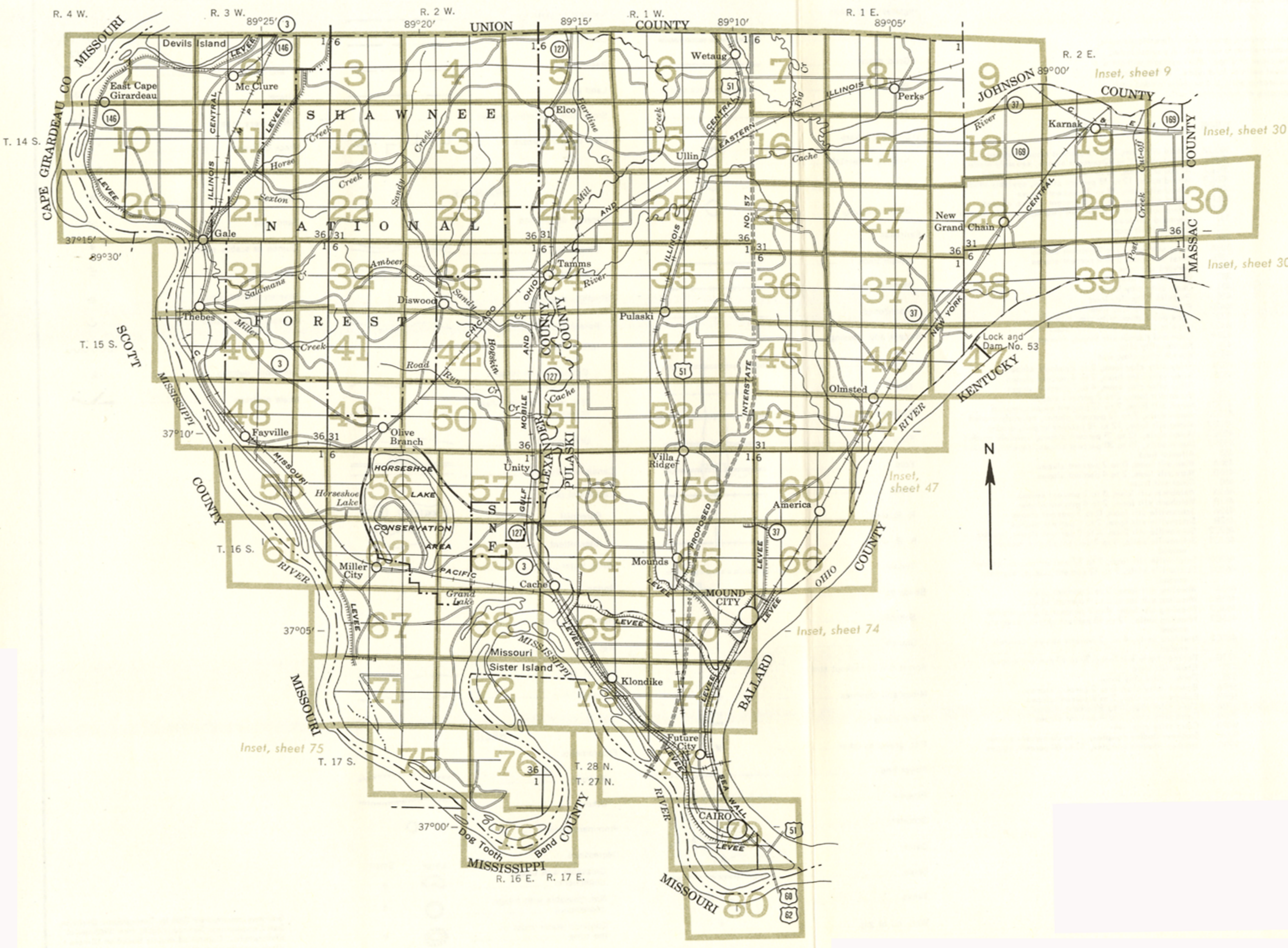
September 1967

SCALE IN MILES

1 0 1 2 3 4

INDEX TO MAP SHEETS

PULASKI AND ALEXANDER COUNTIES, ILLINOIS



CONVENTIONAL SIGNS

WORKS AND STRUCTURES

Highways and roads
- Dual
- Good motor
- Poor motor
- Trail

Highway markers
- National Interstate
- U. S.
- State or county

Railroads
- Single track
- Multiple track
- Abandoned

Bridges and crossings
- Road
- Trail
- Railroad
- Ferry (FY)
- Ford (FORD)
- Grade
- R. R. over
- R. R. under

Tunnel

Buildings
- School
- Church

Forest fire or lookout station

Mines and Quarries

Mine dump

Pits, gravel or other

Power line

Pipeline

Cemetery

Dams

Levee

Tanks

Well, oil or gas

BOUNDARIES

- National or state
- County
- Reservation
- Land grant
- Small park, cemetery, airport
- Land division corners

DRAINAGE

Streams, double-line
- Perennial
- Intermittent

Streams, single-line
- Perennial
- Intermittent
  - Crossable with tillage implements
  - Not crossable with tillage implements
  - Unclassified

Canals and ditches (CANAL)

Lakes and ponds
- Perennial (water, w)
- Intermittent

Wells, water (flowing)

Spring

Marsh or swamp

Wet spot

Alluvial fan

Drainage end

RELIEF

Escarpments
- Bedrock
- Other

Prominent peak

Depressions (Large, Small)
- Crossable with tillage implements
- Not crossable with tillage implements
- Contains water most of the time

SOIL SURVEY DATA

- Soil boundary and symbol (463C2)
- Gravel
- Stony, very stony
- Rock outcrops
- Chert outcrops
- Clay spot
- Sand spot
- Gumbo or scabby spot
- Made land
- Severely eroded spot
- Blowout, wind erosion
- Gully
- Sandstone outcrop
- Shale outcrops

SOIL LEGEND

A number shows the soil type, soil complex, group of undifferentiated soils, or land type. W preceding the number shows a wet soil. A capital letter, A, B, C, D, E, F, or G, shows the class of slope. Most symbols without a slope letter are those of nearly level soils or land types. A final number 2 after the slope letter indicates an eroded soil; 3, a severely eroded soil. A "+" at the end of the symbol indicates an overwashed soil.

SYMBOL	NAME
53B	Bloomfield loamy fine sand, 1 to 6 percent slopes
70	Beaucoup silty clay loam
70+	Beaucoup silty clay, overwash
71A	Darwin silty clay, 0 to 2 percent slopes
W71	Darwin silty clay, wet
71C	Darwin silty clay, 2 to 7 percent slopes
72	Sharon silt loam
75D	Drury silt loam, 4 to 12 percent slopes
84	Okaw silt loam
85	Jacob clay
92	Sarpy loamy fine sand
108	Bonnie silt loam
W108	Bonnie silt loam, wet
108+	Bonnie silty clay loam, overwash
109	Racoon silt loam
131A	Alvin fine sandy loam, 0 to 2 percent slopes
131B	Alvin fine sandy loam, 2 to 4 percent slopes
131C	Alvin fine sandy loam, 4 to 7 percent slopes
131C2	Alvin fine sandy loam, 4 to 7 percent slopes, eroded
131D2	Alvin fine sandy loam, 7 to 12 percent slopes, eroded
V131	Alvin fine sandy loam, thick A2 horizon variant
161	Newart silt loam
162A	Gorham silty clay loam, 0 to 2 percent slopes
162B	Gorham silty clay loam, 2 to 4 percent slopes
164A	Stoy silt loam, 0 to 2 percent slopes
164B	Stoy silt loam, 2 to 4 percent slopes
165	Weir silt loam
175A	Lamont fine sandy loam, 0 to 2 percent slopes
175B	Lamont fine sandy loam, 2 to 4 percent slopes
175C	Lamont fine sandy loam, 4 to 7 percent slopes
178	Ruark fine sandy loam
180	Dupo silt loam
184A	Roby fine sandy loam, 0 to 2 percent slopes
184B	Roby fine sandy loam, 2 to 4 percent slopes
214B	Hosmer silt loam, 2 to 4 percent slopes
214C	Hosmer silt loam, 4 to 7 percent slopes
214C2	Hosmer silt loam, 4 to 7 percent slopes, eroded
214C3	Hosmer soils, 4 to 7 percent slopes, severely eroded
214D2	Hosmer silt loam, 7 to 12 percent slopes, eroded
214D3	Hosmer soils, 7 to 12 percent slopes, severely eroded
214E2	Hosmer silt loam, 12 to 18 percent slopes, eroded
214E3	Hosmer soils, 12 to 18 percent slopes, severely eroded
214F2	Hosmer silt loam, 18 to 30 percent slopes, eroded
214F3	Hosmer soils, 18 to 30 percent slopes, severely eroded
216E	Stookey silt loam, 12 to 18 percent slopes
216F	Stookey silt loam, 18 to 30 percent slopes
216F3	Stookey silt loam, 18 to 30 percent slopes, severely eroded
216G	Stookey silt loam, 30 to 50 percent slopes
219	Millbrook silt loam
266	Disco fine sandy loam
284A	Tice silty clay loam, 0 to 2 percent slopes
284B	Tice silty clay loam, 2 to 4 percent slopes
284+	Tice silty clay, overwash
288	Petrolia silty clay loam
W288	Petrolia silty clay loam, wet
304A	Landes fine sandy loam, 0 to 2 percent slopes
304B	Landes fine sandy loam, 2 to 6 percent slopes
306	Allison silty clay loam
308B	Alford silt loam, 2 to 4 percent slopes
308C	Alford silt loam, 4 to 7 percent slopes
308C2	Alford silt loam, 4 to 7 percent slopes, eroded
308D	Alford silt loam, 7 to 12 percent slopes
308D2	Alford silt loam, 7 to 12 percent slopes, eroded
308D3	Alford soils, 7 to 12 percent slopes, severely eroded
308E2	Alford silt loam, 12 to 18 percent slopes, eroded
308E3	Alford soils, 12 to 18 percent slopes, severely eroded
308F	Alford silt loam, 18 to 30 percent slopes
308F2	Alford silt loam, 18 to 30 percent slopes, eroded
308F3	Alford soils, 18 to 30 percent slopes, severely eroded
331	Haymond silt loam
333	Wakeland silt loam
334	Birds silt loam
338A	Hurst silt loam, 0 to 2 percent slopes
338B	Hurst silt loam, 2 to 4 percent slopes
344	Harvard silt loam
382	Belknap silt loam
401	Okaw silty clay loam
420	Piopolis silty clay loam
W420	Piopolis silty clay loam, wet
422	Cape and Karnak silty clay loams
W422	Cape and Karnak silty clay loams, wet
422+	Cape and Karnak silt loams, overwash
426	Karnak silty clay
W426	Karnak silty clay, wet
452A	Riley silty clay loam, 0 to 2 percent slopes
452B	Riley silty clay loam, 2 to 4 percent slopes
452C	Riley silty clay loam, 4 to 7 percent slopes
453C	Muren silt loam, 2 to 7 percent slopes
453D2	Muren silt loam, 7 to 12 percent slopes, eroded
453D3	Muren soils, 7 to 12 percent slopes, severely eroded
453E2	Muren silt loam, 12 to 18 percent slopes, eroded
453E3	Muren soils, 12 to 18 percent slopes, severely eroded
453F3	Muren soils, 18 to 30 percent slopes, severely eroded
455	Alluvial land
456A	Ware silt loam, 0 to 2 percent slopes
456B	Ware silt loam, 2 to 4 percent slopes
460	Ginat silt loam
461A	Weinbach silt loam, 0 to 2 percent slopes
461B	Weinbach silt loam, 2 to 4 percent slopes
462A	Sciotoville silt loam, 0 to 2 percent slopes
462B	Sciotoville silt loam, 2 to 4 percent slopes
462C2	Sciotoville silt loam, 4 to 7 percent slopes, eroded
462C3	Sciotoville soils, 4 to 7 percent slopes, severely eroded
462D2	Sciotoville silt loam, 7 tc 12 percent slopes, eroded
462D3	Sciotoville soils, 7 to 12 percent slopes, severely eroded
463A	Wheeling silt loam, 0 to 2 percent slopes
463B	Wheeling silt loam, 2 to 4 percent slopes
463C2	Wheeling silt loam, 4 to 7 percent slopes, eroded
463E3	Wheeling soils, 12 to 18 percent slopes, severely eroded
467C3	Markland soils, 4 to 12 percent slopes, severely eroded
471G	Bodine cherty silt loam, 30 to 60 percent slopes
475	Elsah silt loam
525	Darwin silty clay loam
589A	Bowdre silty clay, 0 to 2 percent slopes
589B	Bowdre silty clay, 2 to 7 percent slopes
590A	Cairo silty clay, 0 to 2 percent slopes
590B	Cairo silty clay, 2 to 4 percent slopes
W590	Cairo silty clay, wet
990F	Stookey–Bodine complex, 18 to 30 percent slopes
990G	Stookey–Bodine complex, 30 to 60 percent slopes

Soil map constructed 1966 by Cartographic Division, Soil Conservation Service, USDA, from 1965 aerial photographs. Controlled mosaic based on Illinois plane coordinate system, west zone, transverse Mercator projection, 1927 North American datum.

GUIDE TO MAPPING UNITS

[For a full description of a mapping unit, read both the description of the mapping unit and the description of the soil series to which the mapping unit belongs.

[See table 1, page 8, for approximate acreage and proportionate extent of the soils and table 2, page 45, for estimated yields per acre of the principal crops. For facts about woodland groups, see table 3, page 54. For facts about the engineering properties of the soils, turn to the section beginning on page 70]

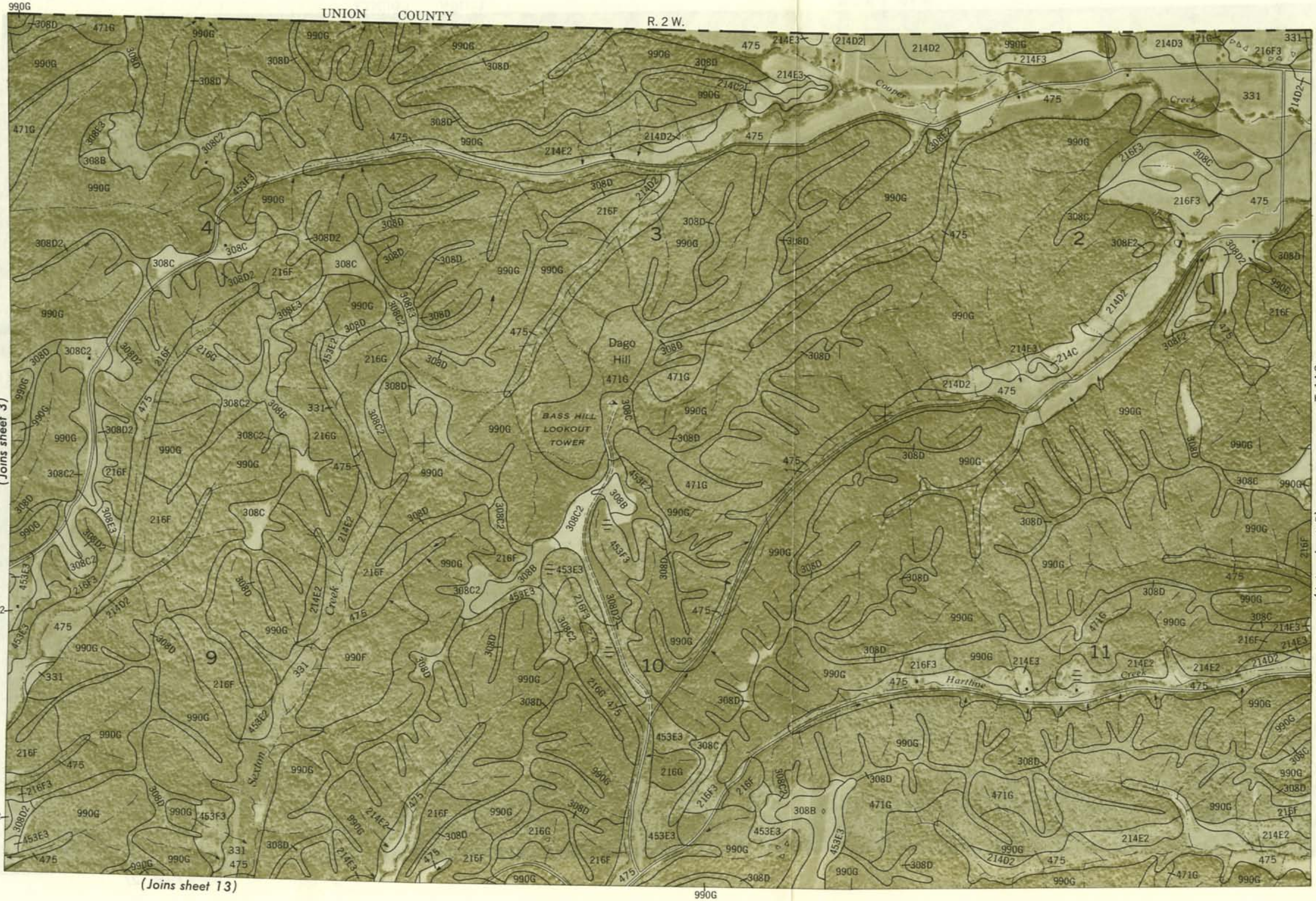
Map symbol	Mapping units	Described on page	Management groups		Fruit and vegetable groups		Wildlife groups		Recreation groups		Woodland groups
			Symbol	Page	Number	Page	Number	Page	Number	Page	Number
53B	Bloomfield loamy fine sand, 1 to 6 percent slopes	13	IVs-1	43	8	50	8	64	9	68	8
70	Beaucoup silty clay loam	12	IIw-4	36	14	52	10	64	16	70	11
70+	Beaucoup silty clay, overwash	12	IIw-4	36	14	52	10	64	16	70	11
71A	Darwin silty clay, 0 to 2 percent slopes	15	IIIw-4	39	14	52	11	64	16	70	11
W71	Darwin silty clay, wet	16	Vw-1	43	15	52	12	64	17	70	12
71C	Darwin silty clay, 2 to 7 percent slopes	16	IIIw-4	39	14	52	11	64	16	70	11
72	Sharon silt loam	28	I-2	34	9	51	1	62	12	69	9
75D	Drury silt loam, 4 to 12 percent slopes	16	IIIe-1	38	2	49	2	62	3	67	2
84	Okaw silt loam	24	IIIw-2	39	6	50	10	64	11	69	7
85	Jacob clay	21	IVw-2	42	14	52	11	64	16	70	11
	Where wet spots are indicated on detailed soil map	--	Vw-1	43	--	--	--	--	--	--	--
92	Sarpy loamy fine sand	27	IVs-1	43	8	50	8	64	9	68	13
108	Bonnie silt loam	14	IIIw-3	39	11	51	10	64	15	70	10
W108	Bonnie silt loam, wet	14	Vw-1	43	15	52	12	64	17	70	12
108+	Bonnie silty clay loam, overwash	14	Vw-1	43	15	52	12	64	17	70	12
109	Racoon silt loam	26	IIIw-2	39	6	50	10	64	11	69	7
131A	Alvin fine sandy loam, 0 to 2 percent slopes	11	IIs-1	37	7	50	1	62	1	67	8
131B	Alvin fine sandy loam, 2 to 4 percent slopes	11	IIe-3	35	7	50	2	62	2	67	8
131C	Alvin fine sandy loam, 4 to 7 percent slopes	11	IIe-3	35	7	50	2	62	2	67	8
131C2	Alvin fine sandy loam, 4 to 7 percent slopes, eroded	11	IIe-3	35	7	50	2	62	2	67	8
131D2	Alvin fine sandy loam, 7 to 12 percent slopes, eroded	12	IIIe-1	38	7	50	2	62	3	67	8
V131	Alvin fine sandy loam, thick A2 horizon variant	12	IIs-1	37	7	50	1	62	1	67	8
161	Newart silt loam	24	IIw-5	37	12	51	1	62	14	69	13
	If protected by levees	--	I-3	34	--	--	--	--	--	--	--
162A	Gorham silty clay loam, 0 to 2 percent slopes	17	IIw-5	37	13	52	1	62	13	69	13
	If protected by levees	--	I-3	34	--	--	--	--	--	--	--
162B	Gorham silty clay loam, 2 to 4 percent slopes	18	IIe-4	35	13	52	1	62	13	69	13
164A	Stoy silt loam, 0 to 2 percent slopes	30	IIw-1	35	5	49	6	63	10	69	6
164B	Stoy silt loam, 2 to 4 percent slopes	30	IIw-1	35	5	49	7	63	10	69	6
165	Weir silt loam	32	IIIw-2	39	6	50	10	64	11	69	7
175A	Lamont fine sandy loam, 0 to 2 percent slopes	22	IIIs-1	40	8	50	8	64	1	67	8
175B	Lamont fine sandy loam, 2 to 4 percent slopes	22	IIIs-1	40	8	50	8	64	2	67	8
175C	Lamont fine sandy loam, 4 to 7 percent slopes	22	IIIs-1	40	8	50	8	64	2	67	8
178	Ruark fine sandy loam	27	IIIw-2	39	6	50	10	64	11	69	7
180	Dupo silt loam	17	IIw-3	36	10	51	6	63	14	69	9
184A	Roby fine sandy loam, 0 to 2 percent slopes	26	IIs-1	37	5	49	6	63	10	69	8
184B	Roby fine sandy loam, 2 to 4 percent slopes	26	IIe-3	35	5	49	7	63	10	69	8
214B	Hosmer silt loam, 2 to 4 percent slopes	19	IIe-2	35	1	48	2	62	2	67	1
214C	Hosmer silt loam, 4 to 7 percent slopes	19	IIIe-2	38	1	48	2	62	2	67	1
214C2	Hosmer silt loam, 4 to 7 percent slopes, eroded	19	IIIe-2	38	1	48	2	62	2	67	1
214C3	Hosmer soils, 4 to 7 percent slopes, severely eroded	19	IVe-2	41	2	49	2	62	4	68	1
214D2	Hosmer silt loam, 7 to 12 percent slopes, eroded	19	IIIe-2	38	2	49	2	62	3	67	1
214D3	Hosmer soils, 7 to 12 percent slopes, severely eroded	20	IVe-2	41	2	49	3	63	4	68	1
214E2	Hosmer silt loam, 12 to 18 percent slopes, eroded	20	IVe-2	41	3	49	3	63	5	68	1
214E3	Hosmer soils, 12 to 18 percent slopes, severely eroded	20	VIe-2	44	3	49	3	63	6	68	1
214F2	Hosmer silt loam, 18 to 30 percent slopes, eroded	20	VIe-2	44	3	49	3	63	7	68	3
214F3	Hosmer soils, 18 to 30 percent slopes, severely eroded	20	VIe-2	44	3	49	3	63	7	68	3
216E	Stookey silt loam, 12 to 18 percent slopes	29	IVe-1	41	3	49	3	63	5	68	2
216F	Stookey silt loam, 18 to 30 percent slopes	29	VIe-1	43	3	49	3	63	7	68	3
216F3	Stookey silt loam, 18 to 30 percent slopes, severely eroded	29	VIe-1	43	3	49	3	63	7	68	3
216G	Stookey silt loam, 30 to 50 percent slopes	29	VIIe-1	44	3	49	4	63	8	68	3
219	Millbrook silt loam	23	I-1	34	5	49	1	62	10	69	6
266	Disco fine sandy loam	16	IIIs-1	40	8	50	8	64	1	67	8
284A	Tice silty clay loam, 0 to 2 percent slopes	30	IIw-5	37	13	52	1	62	13	69	13
	If protected by levees	--	I-3	34	--	--	--	--	--	--	--
284B	Tice silty clay loam, 2 to 4 percent slopes	30	IIe-4	35	13	52	1	62	13	69	13
284+	Tice silty clay, overwash	30	IIw-5	37	14	52	1	62	16	70	13
288	Petrolia silty clay loam	25	IIw-4	36	14	52	10	64	16	70	11
W288	Petrolia silty clay loam, wet	25	Vw-1	43	15	52	12	64	17	70	12
304A	Landes fine sandy loam, 0 to 2 percent slopes	22	IIIs-1	40	12	51	8	64	12	69	13
304B	Landes fine sandy loam, 2 to 6 percent slopes	22	IIIs-1	40	12	51	8	64	12	69	13
306	Allison silty clay loam	11	IIw-5	37	13	52	1	62	12	69	13
	If protected by levees	--	I-3	34	--	--	--	--	--	--	--
308B	Alford silt loam, 2 to 4 percent slopes	7	IIe-1	34	1	48	2	62	2	67	2
308C	Alford silt loam, 4 to 7 percent slopes	9	IIe-1	34	1	48	2	62	2	67	2
308C2	Alford silt loam, 4 to 7 percent slopes, eroded	9	IIe-1	34	1	48	2	62	2	67	2
308D	Alford silt loam, 7 to 12 percent slopes	9	IIIe-1	38	2	49	2	62	3	67	2
308D2	Alford silt loam, 7 to 12 percent slopes, eroded	10	IIIe-1	38	2	49	2	62	3	67	2
308D3	Alford soils, 7 to 12 percent slopes, severely eroded	10	IVe-1	41	2	49	2	62	4	68	2


N
UNION COUNTY
CAPE GIRARDEAU COUNTY MISSOURI
MISSISSIPPI RIVER
DEVILS ISLAND
PICAYUNE CHUTE
LEVEE
BORROW PIT
T. 14 S.
(Joins sheet 2)
R. 4 W. | R. 3 W.
W71
(Joins sheet 10)

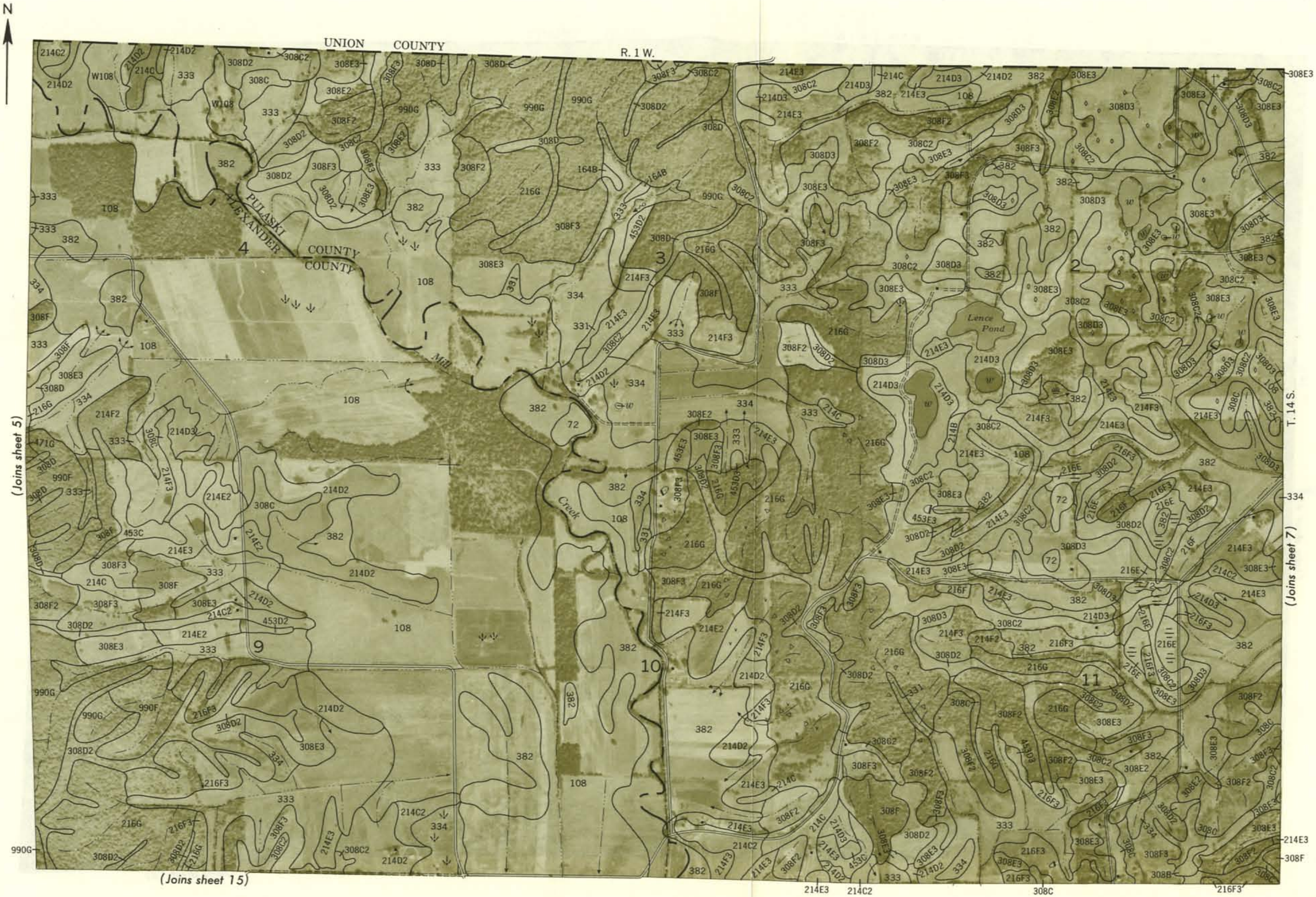

N
UNION COUNTY
R. 3 W.
T. 14 S.
DEVILS ISLAND
PICAYUNE ISLAND
PICAYUNE CHUTE
BORROW PIT
LEVEE
Water
OLD CLEAR CREEK
McCLURE
ILLINOIS CENTRAL
MISSOURI PACIFIC
(Joins sheet 1)
(Joins sheet 11)
(Joins sheet 3)

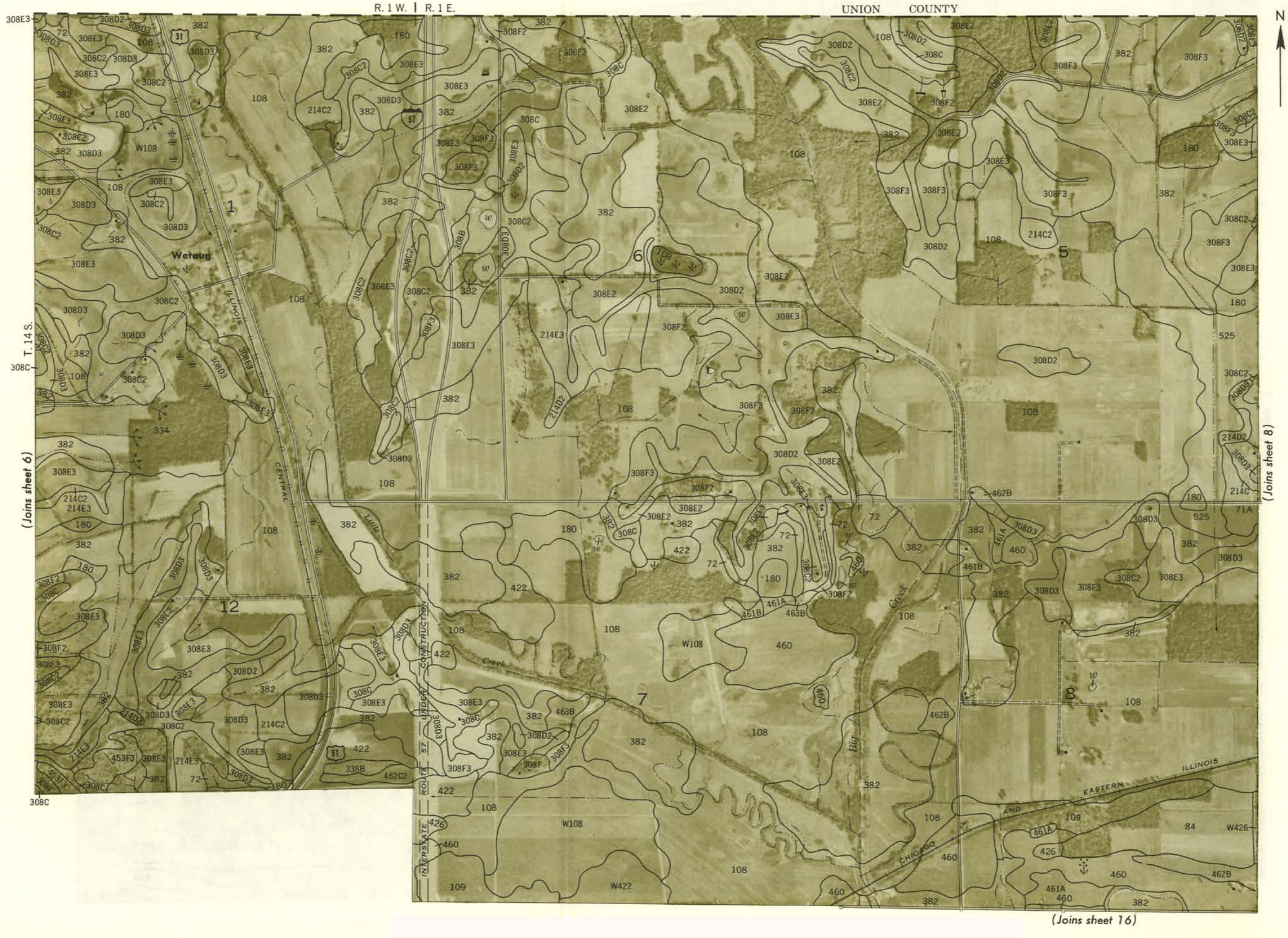

N
R. 3 W. | R. 2 W.
UNION COUNTY
T. 14 S.
(Joins sheet 2)
(Joins sheet 4)
(Joins sheet 12)
Dogwood Flats
South Ripple Hollow
Happy Hollow
Dongola Hollow
Vick Hill
Clear Creek Levee Ditch
Water
BORROW PIT
B.P.

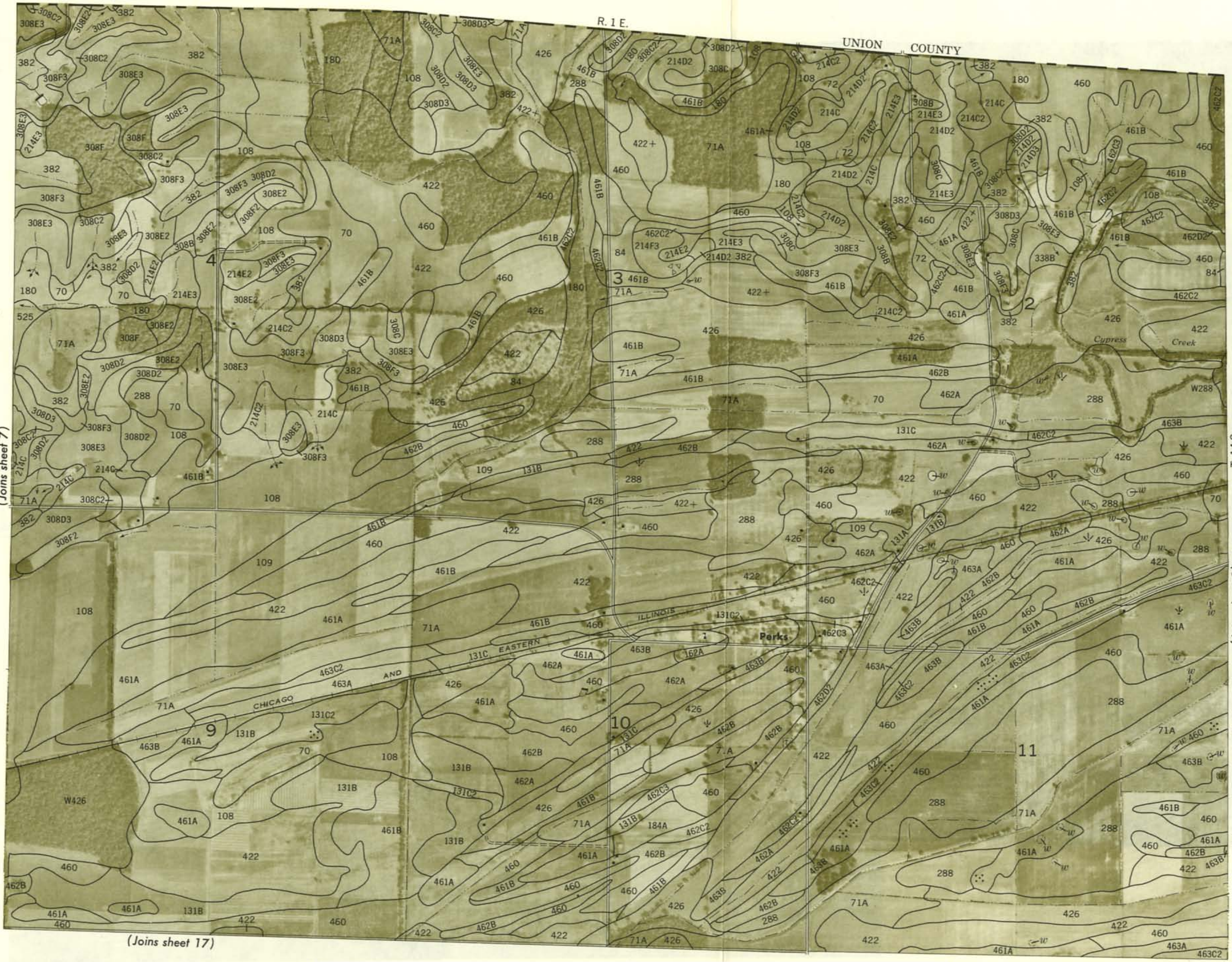
N

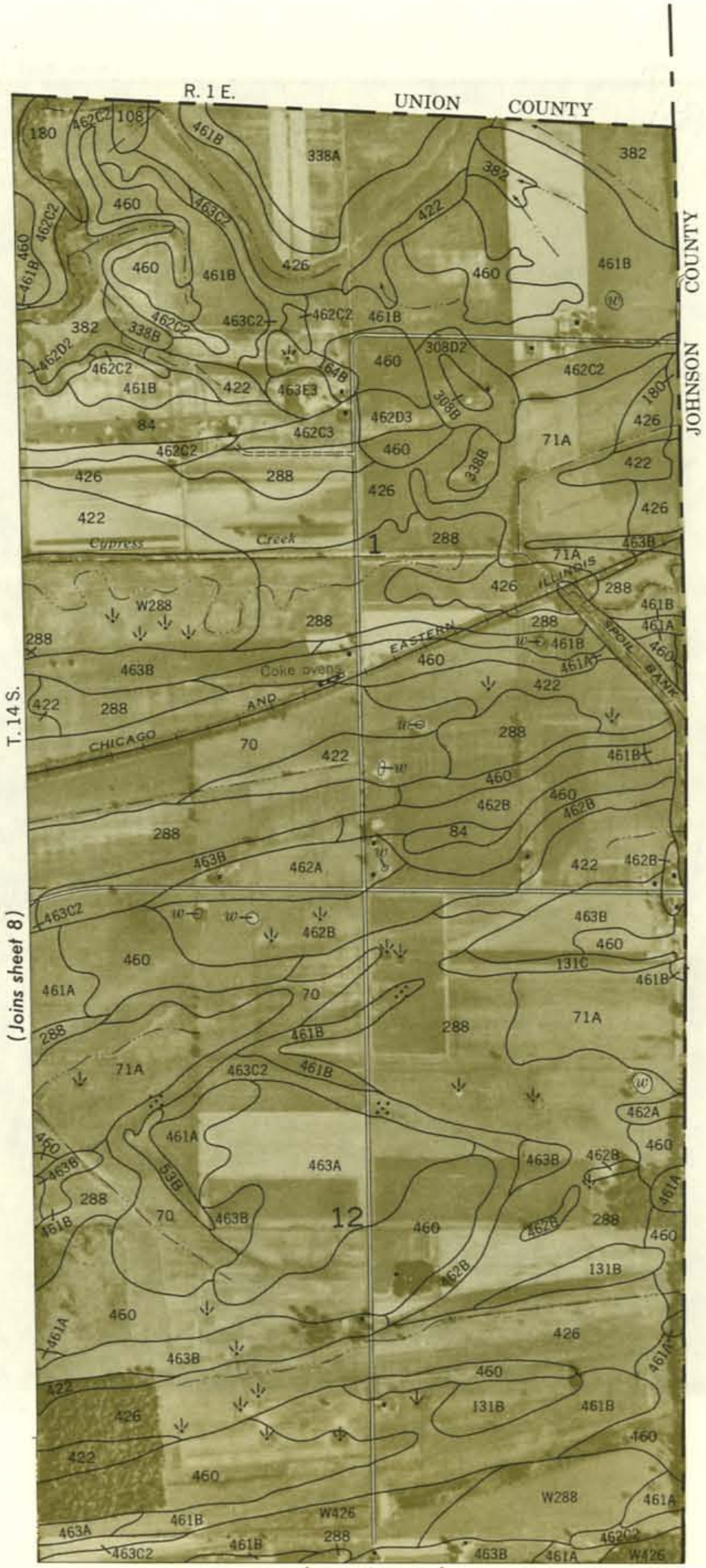

UNION COUNTY
R. 2 W.
T. 14 S.
(Joins sheet 3)
(Joins sheet 5)
(Joins sheet 13)
Cooper Creek
Harthne Creek
Sexton Creek
Dago Hill
BASS HILL LOOKOUT TOWER
2
3
4
9
10
11
990G
308D
471G
475
214D2
214E3
216F
308C2
453E3
331


N
R. 2 W. | R. 1 W.
UNION COUNTY
PULASKI
ALEXANDER
COUNTY
COUNTY
Mill Creek
Cooper Creek
OHIO
MOBILE
GULF
Dry Hollow
T. 14 S.
(Joins sheet 4)
(Joins sheet 6)
(Joins sheet 14)


N
UNION COUNTY
R. 1 W.
PULASKI COUNTY
ALEXANDER COUNTY
Mill Creek
Lence Pond
T. 14 S.
4
3
2
9
10
11
(Joins sheet 5)
(Joins sheet 7)
(Joins sheet 15)


R. 1 W. | R. 1 E.
UNION COUNTY
N
T. 14 S.
(Joins sheet 6)
(Joins sheet 8)
(Joins sheet 16)
Wetaug
ILLINOIS CENTRAL
INTERSTATE ROUTE 57 UNDER CONSTRUCTION
Little Creek
Big Creek
ILLINOIS EASTERN AND CHICAGO
51
57
1
5
6
7
8
12


N
R. 1 E.
UNION COUNTY
T. 14 S.
(Joins sheet 7)
(Joins sheet 9)
(Joins sheet 17)
Cypress Creek
Perks
ILLINOIS CENTRAL
CHICAGO AND EASTERN ILLINOIS
2
3
4
9
10
11



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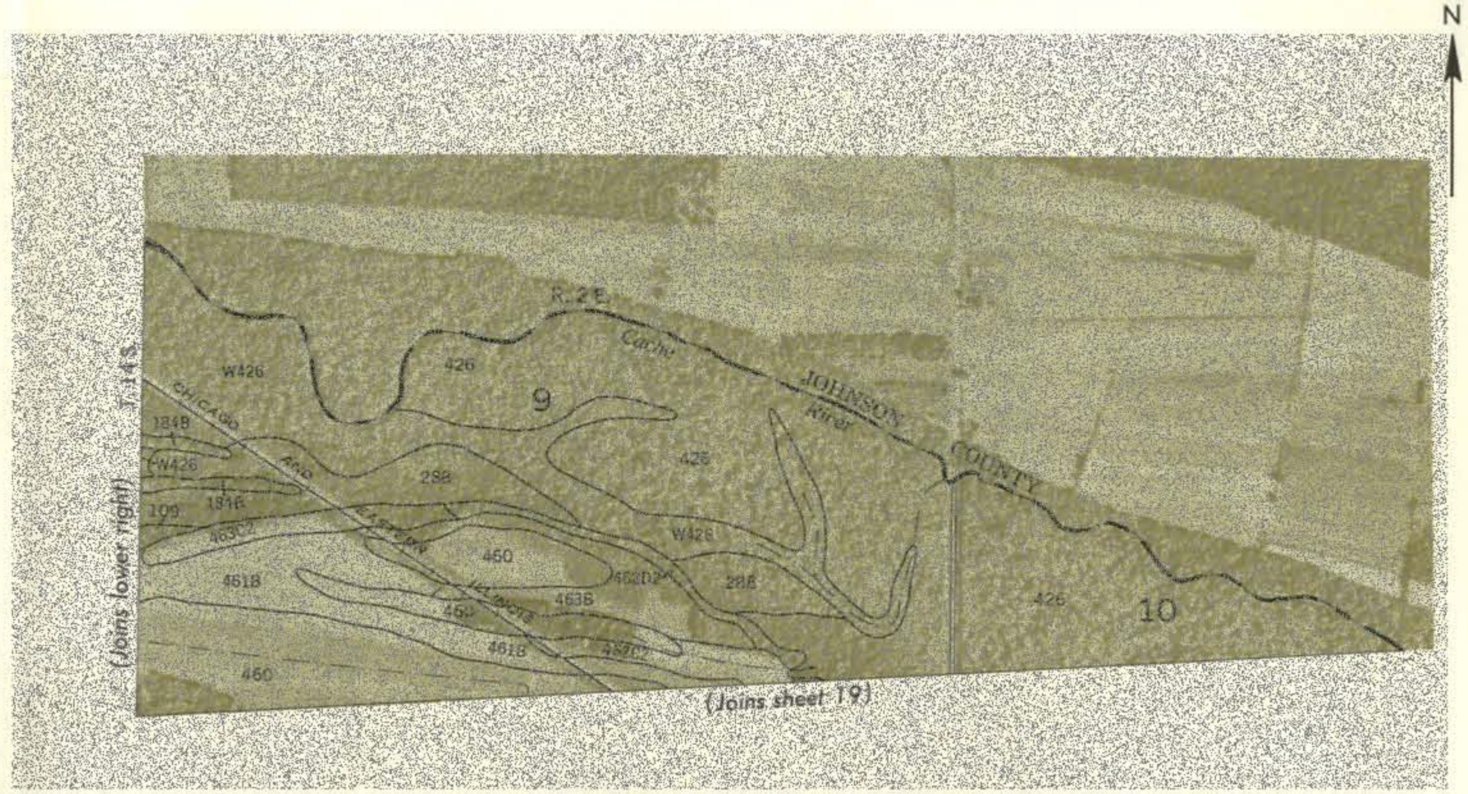

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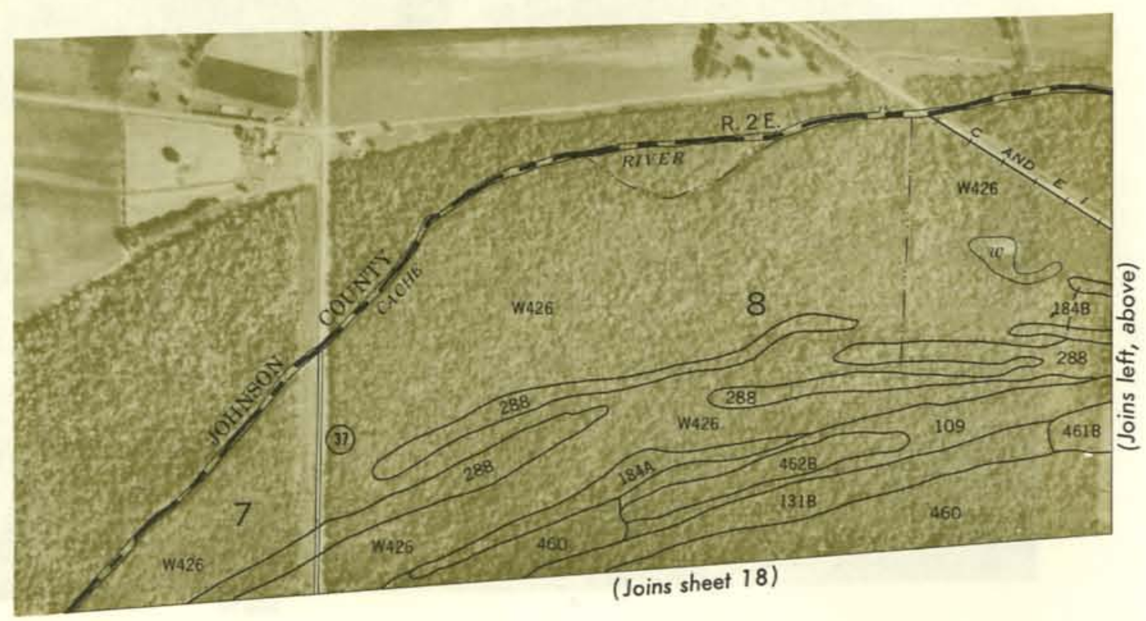
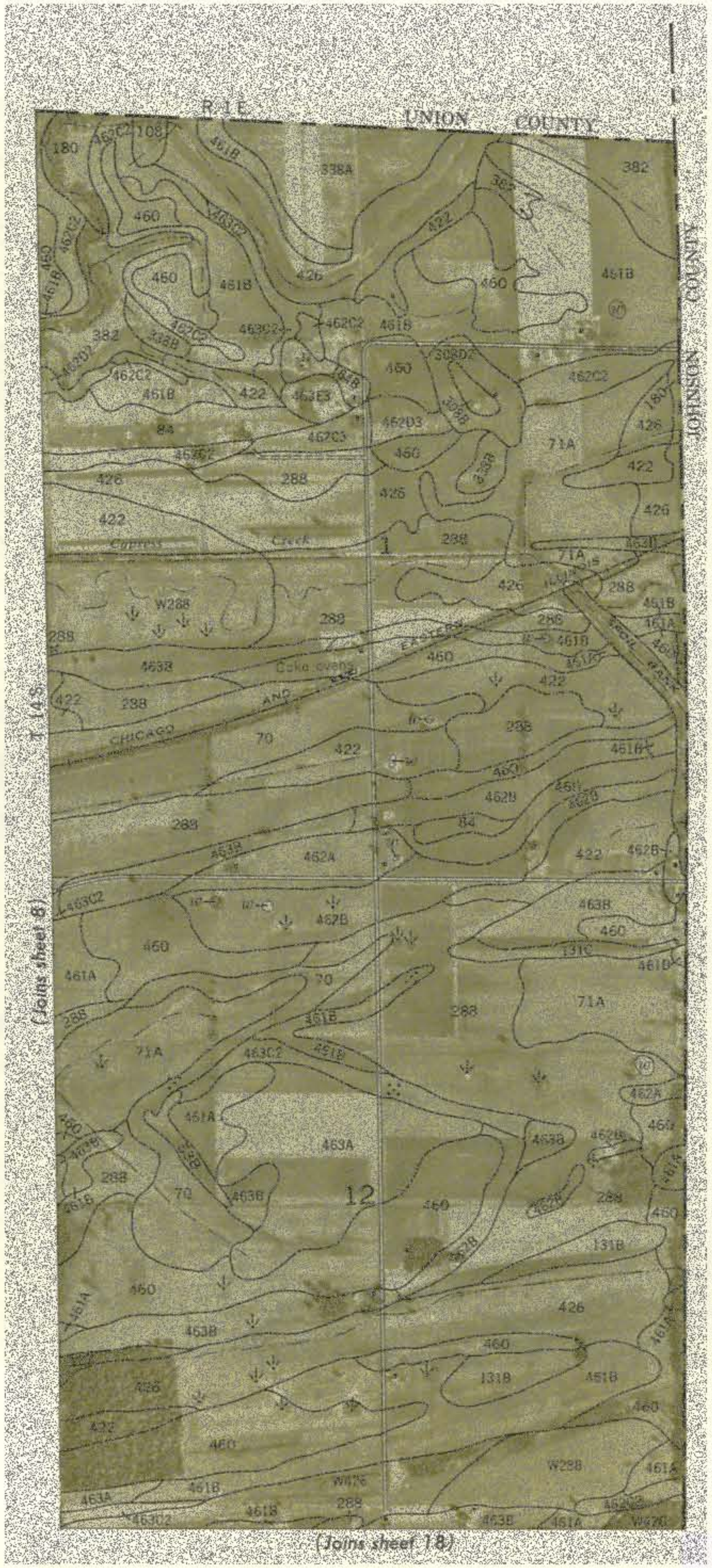
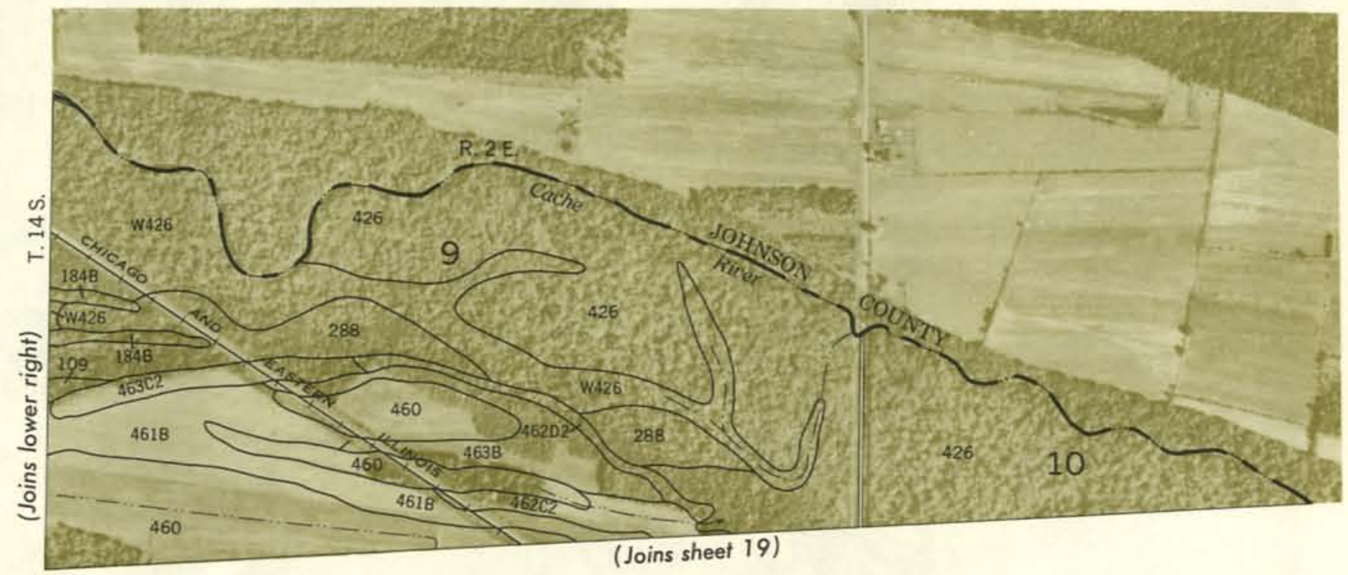
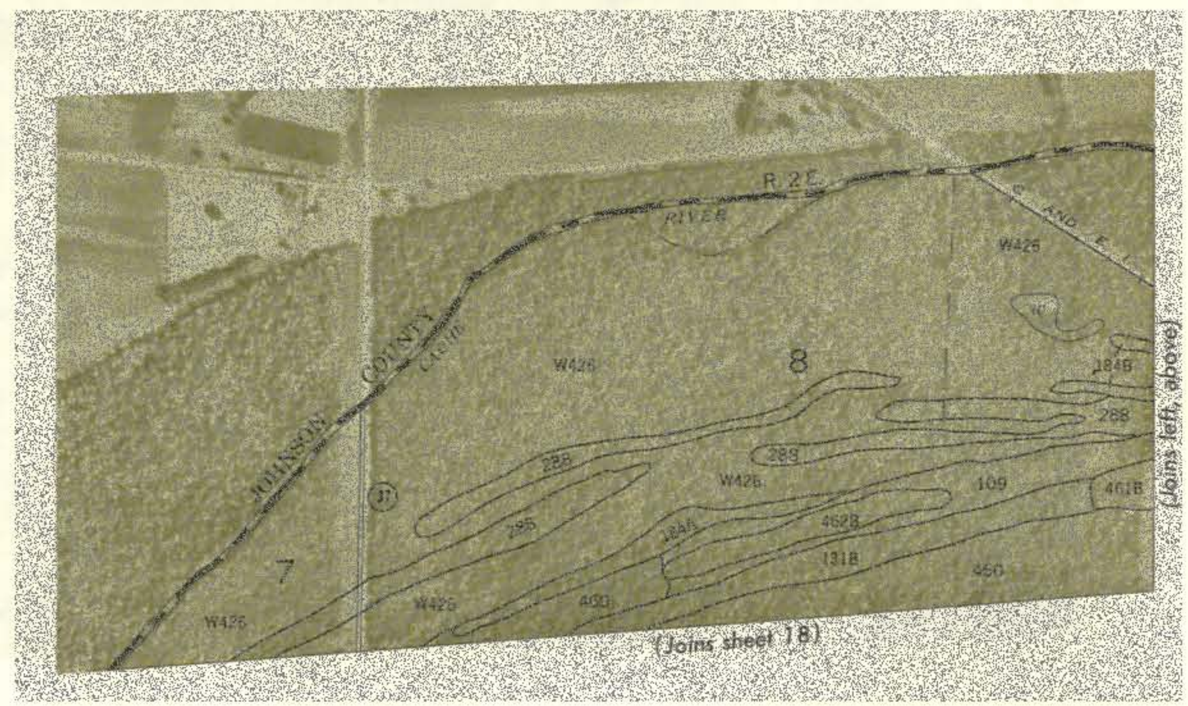


(Joins sheet 18)

N


R.1 E.
UNION COUNTY
JOHNSON COUNTY
T. 14 S.
(Joins sheet 8)
(Joins sheet 18)
Cypress Creek
CHICAGO AND EASTERN
1
12


R. 2 E.
T. 14 S.
Cache River
JOHNSON COUNTY
CHICAGO AND EASTERN ILLINOIS
9
10
(Joins lower right)
(Joins sheet 19)


R. 2 E.
RIVER
JOHNSON COUNTY
Cache
7
8
(Joins left, above)
(Joins sheet 18)

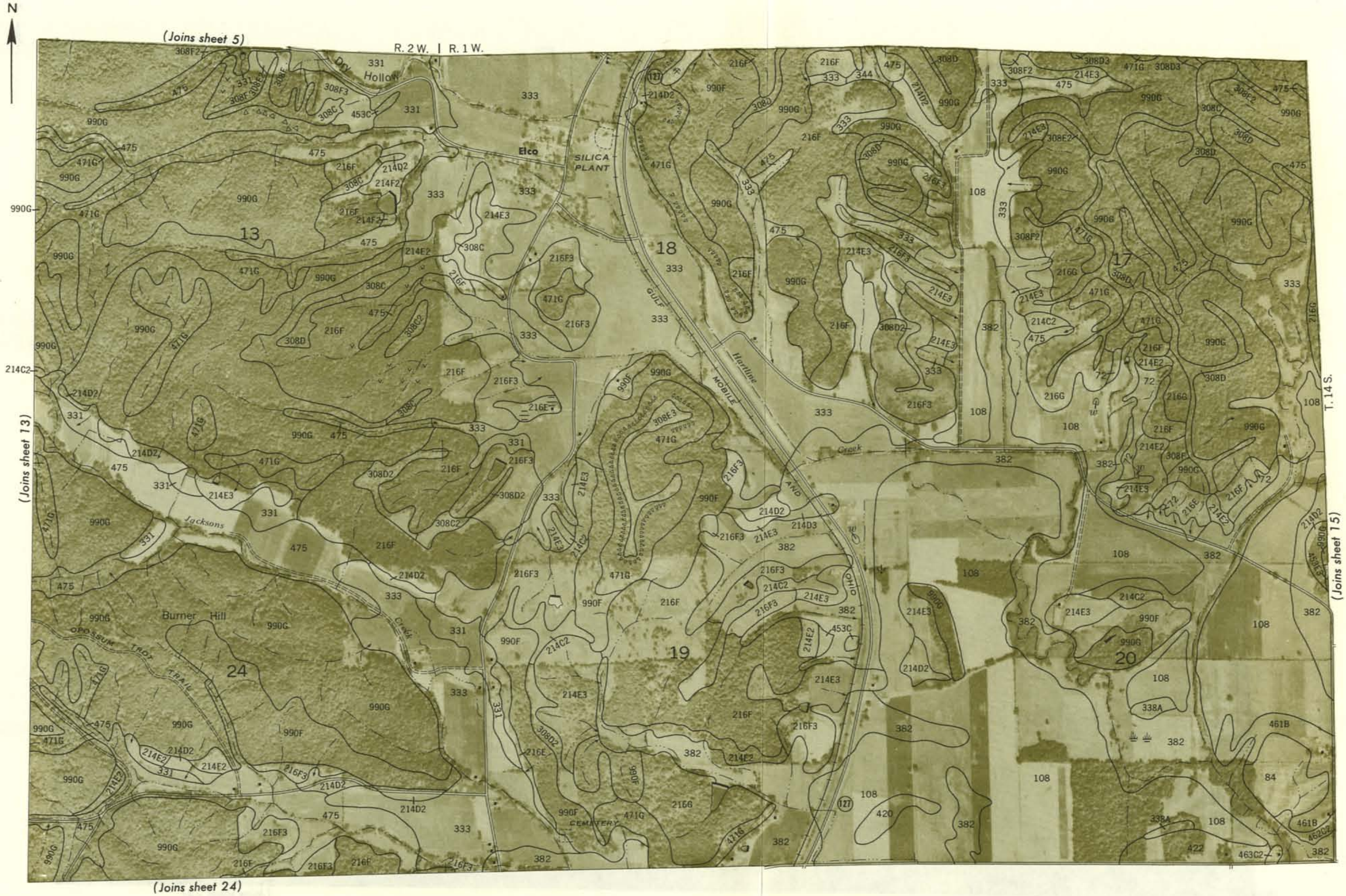
PULASKI AND ALEXANDER COUNTIES, ILLINOIS — SHEET NUMBER 10

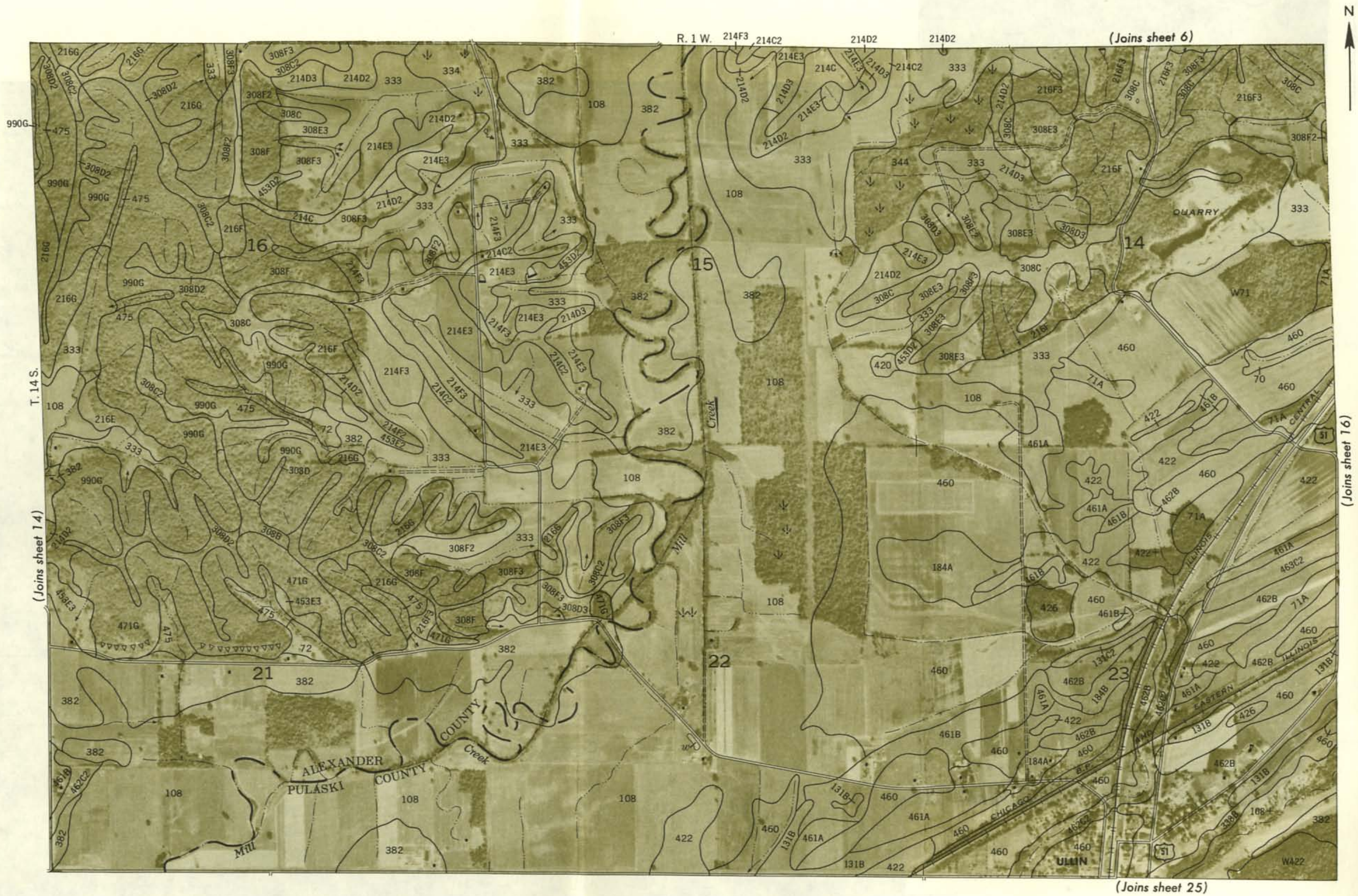

N
R. 3 W.
(Joins sheet 2)
990G
T. 14 S.
(Joins sheet 10)
(Joins sheet 12)
216F
(Joins sheet 21)
16
15
14
21
22
23
ILLINOIS
CENTRAL
MISSOURI
PACIFIC
LEVEE
BORROW
PIT
CLEAR
CREEK
DITCH
Horse
Creek
3
146

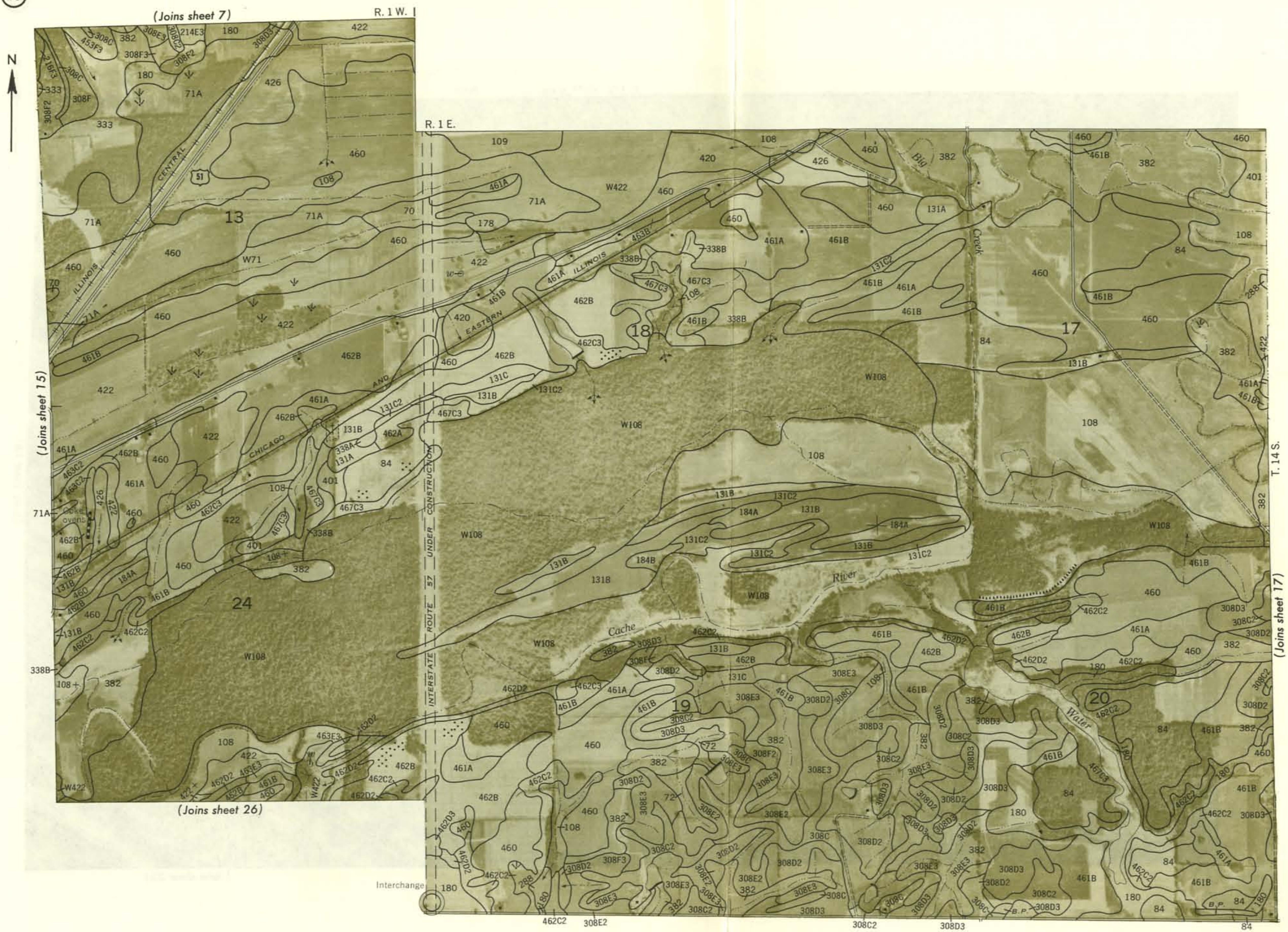
12

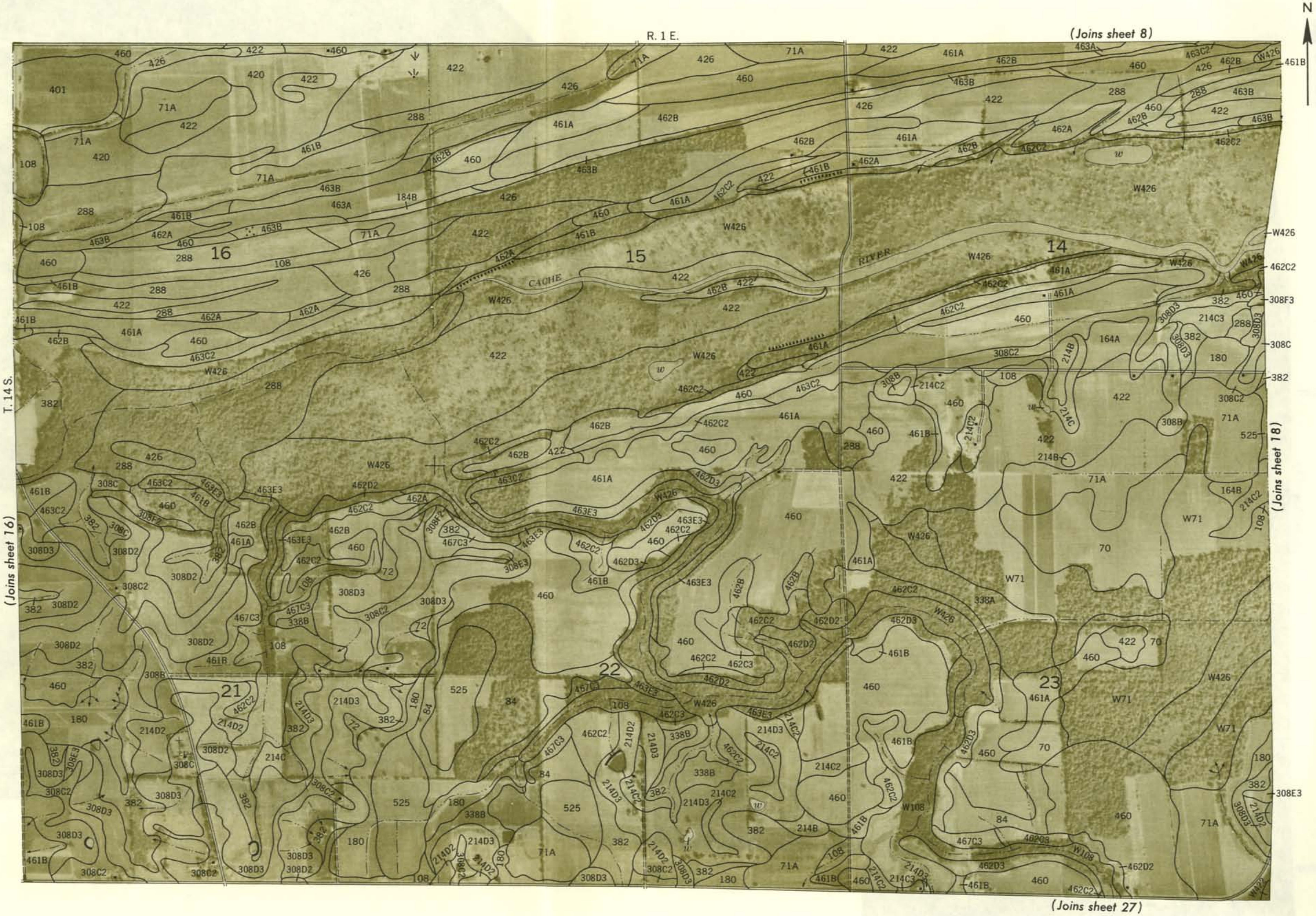

N
(Joins sheet 3)
R. 3 W. | R. 2 W.
(Joins sheet 11)
(Joins sheet 13)
(Joins sheet 22)
T. 14 S.
13
18
17
24
19
20
Creek
Horse
SEXTON
CREEK

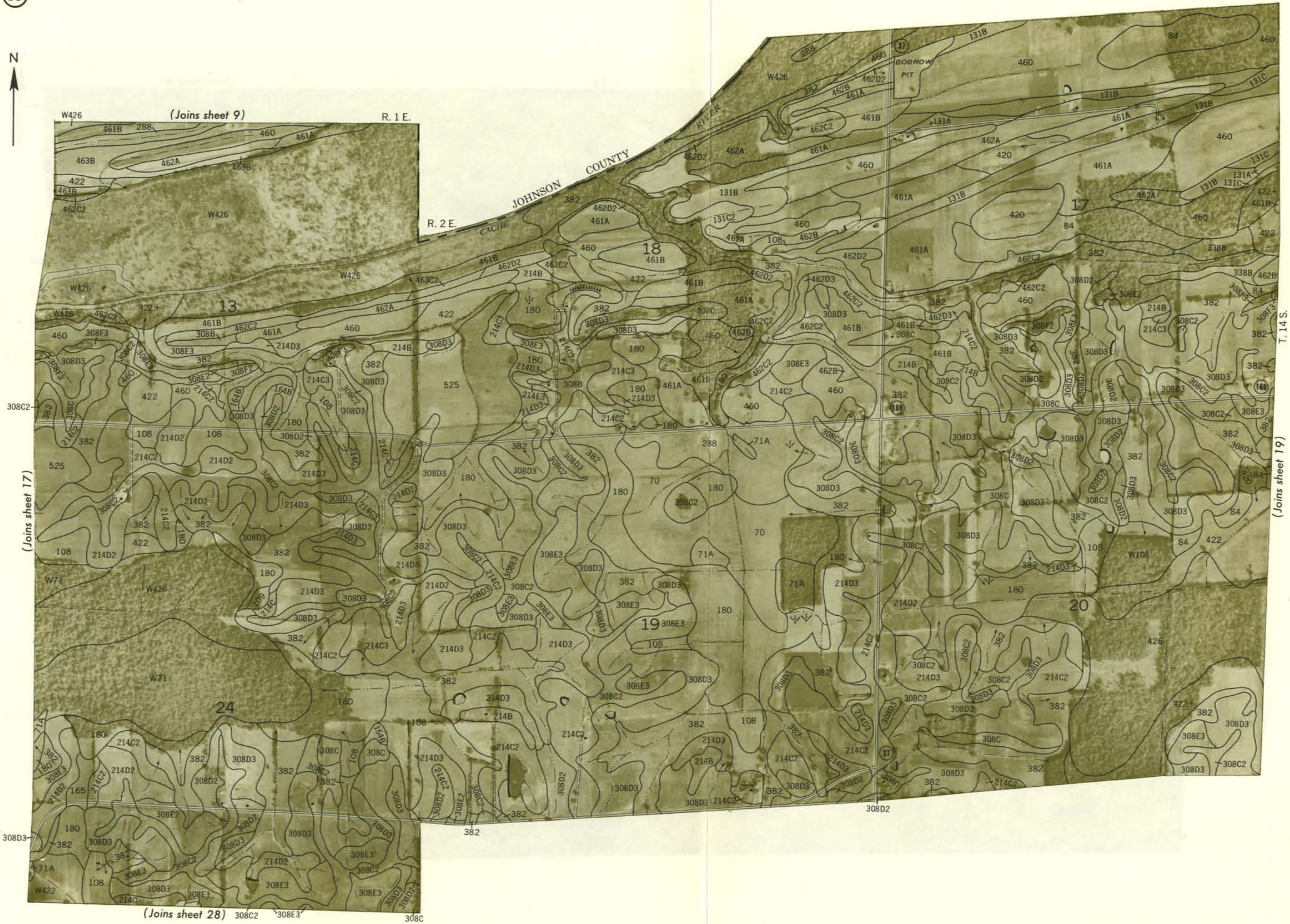

N
(Joins sheet 4)
(Joins sheet 12)
(Joins sheet 14)
(Joins sheet 23)
R. 2 W.
T. 14 S.
16
15
14
21
22
23
Sexton Creek
Creek
Jacksons Creek
Sandy
OPOSSUM TROT TRAIL
CEMETERY


N
(Joins sheet 5)
R. 2 W. | R. 1 W.
(Joins sheet 13)
(Joins sheet 15)
(Joins sheet 24)
T. 14 S.
Dry Hollow
Elco
SILICA PLANT
GULF MOBILE AND OHIO
Hartline
Jacksons Creek
Burner Hill
OPOSSUM TROT TRAIL
CEMETERY
13
18
17
24
19
20

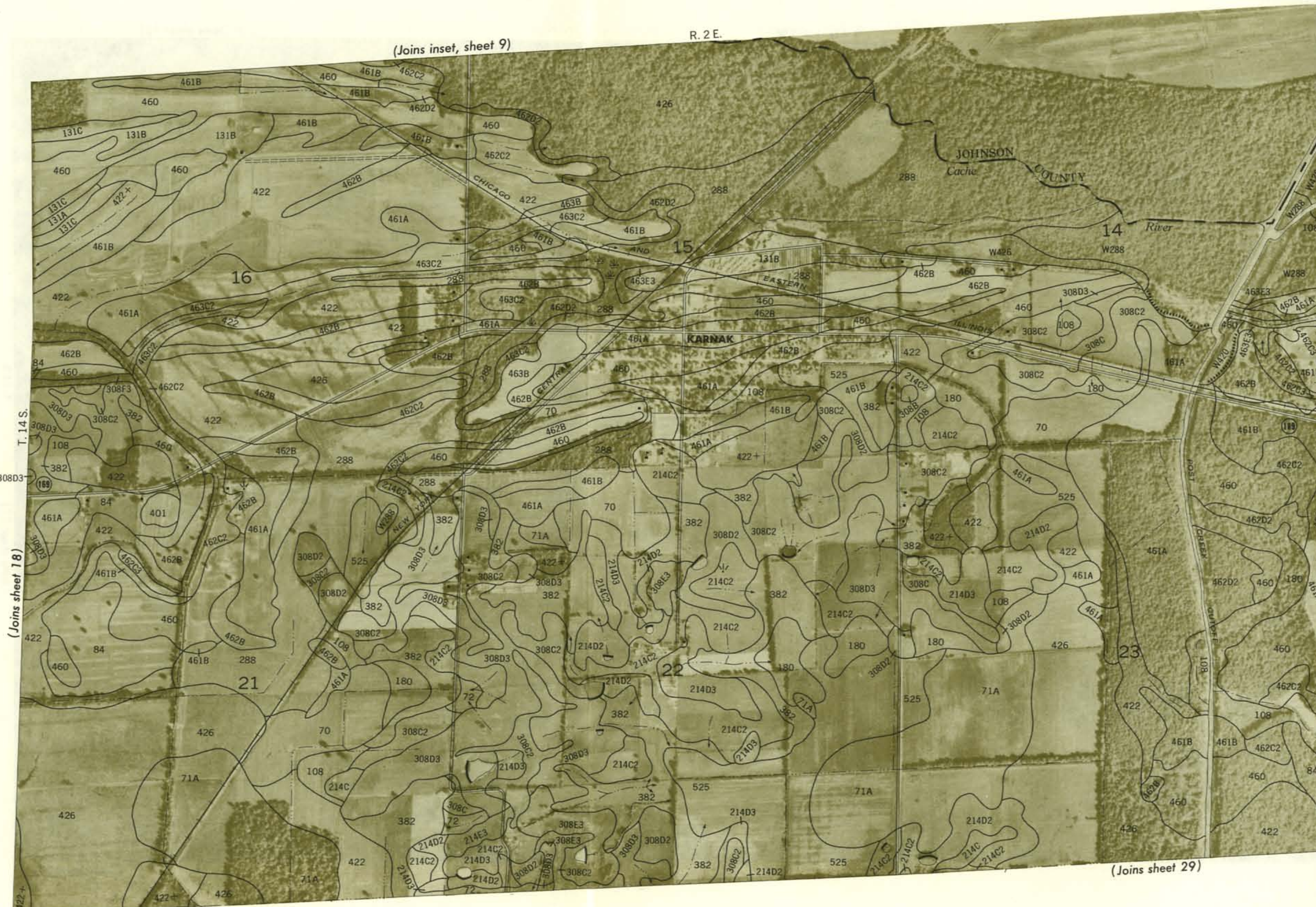

N
R. 1 W.
(Joins sheet 6)
(Joins sheet 16)
(Joins sheet 25)
(Joins sheet 14)
T. 14 S.
QUARRY
ULLIN
ALEXANDER COUNTY
PULASKI COUNTY
Mill Creek
Creek
ILLINOIS CENTRAL
CHICAGO AND EASTERN ILLINOIS R.R.
51
14
15
16
21
22
23

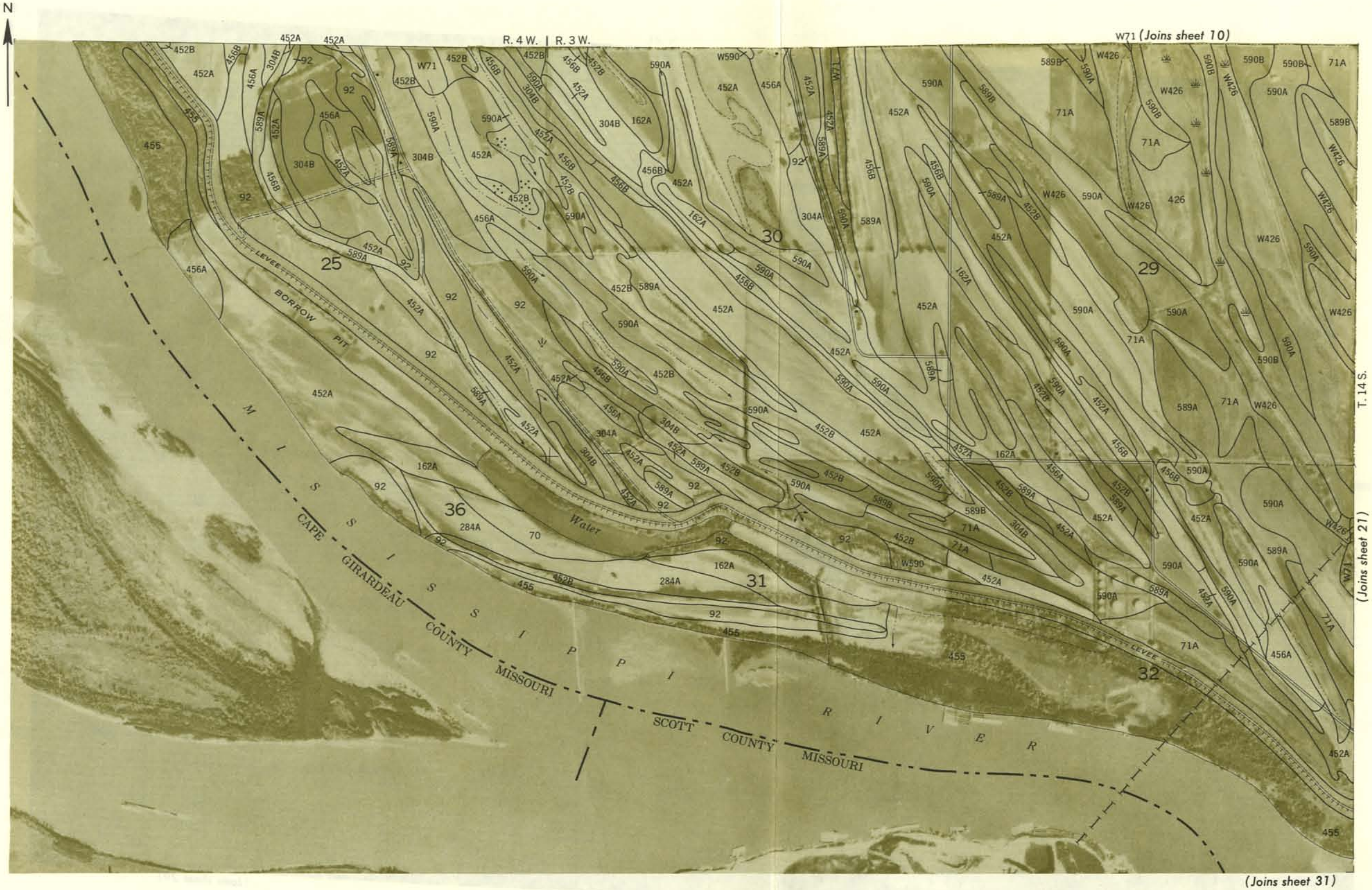

(Joins sheet 7)
R. 1 W.
R. 1 E.
N
(Joins sheet 15)
(Joins sheet 17)
(Joins sheet 26)
T. 14 S.
ILLINOIS CENTRAL
51
ILLINOIS
CHICAGO AND EASTERN
INTERSTATE ROUTE 57 UNDER CONSTRUCTION
Big Creek
Cache River
Water
Coke ovens
Interchange
B.P.
13
17
18
19
20
24


N
(Joins sheet 8)
R. 1 E.
T. 14 S.
(Joins sheet 16)
(Joins sheet 18)
(Joins sheet 27)
CACHE
RIVER
16
15
14
21
22
23

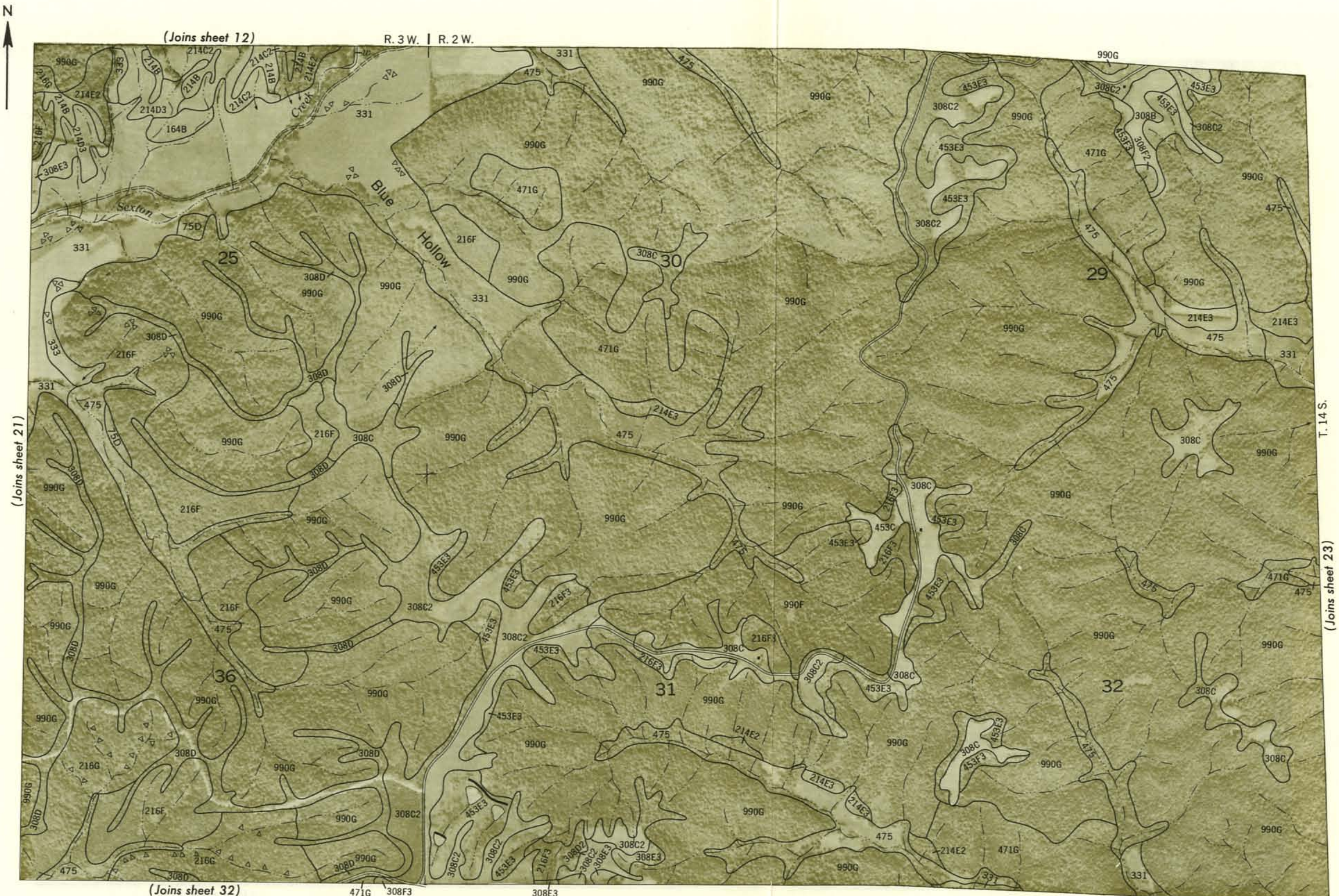

N
(Joins sheet 9)
R. 1 E.
R. 2 E.
CACHE RIVER
JOHNSON COUNTY
BORROW PIT
T. 14 S.
(Joins sheet 17)
(Joins sheet 19)
(Joins sheet 28)
13
17
18
19
20
24

N


(Joins inset, sheet 9)
R. 2 E.
JOHNSON COUNTY
Cache
River
CHICAGO AND EASTERN ILLINOIS
CENTRAL
NEW YORK
KARNAK
POST
CREEK
CUTOFF
T. 14 S.
(Joins sheet 18)
(Joins center inset, sheet 30)
(Joins sheet 29)
14
15
16
21
22
23

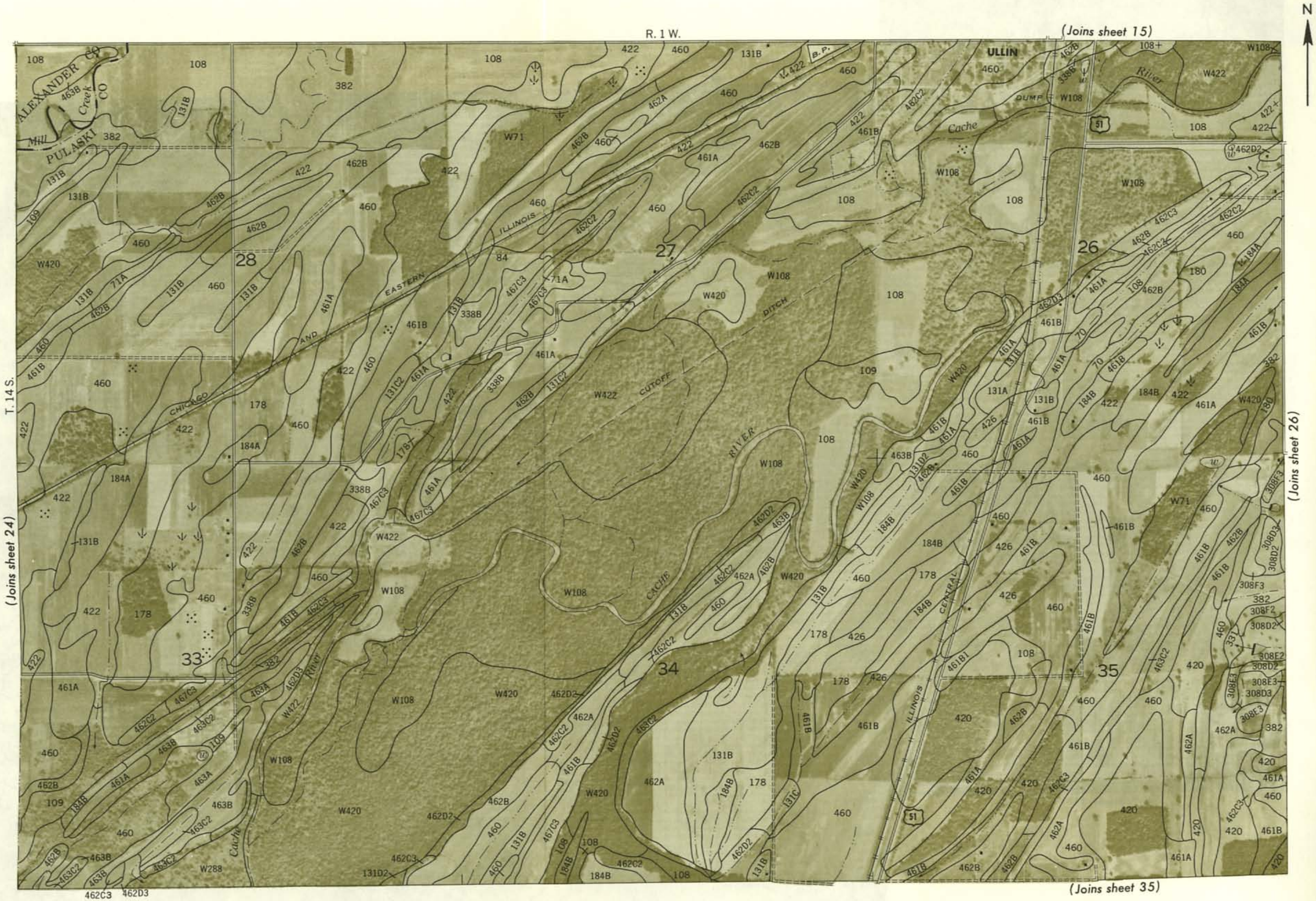

N
R. 4 W. | R. 3 W.
(Joins sheet 10)
T. 14 S.
(Joins sheet 21)
(Joins sheet 31)
25
30
29
36
31
32
LEVEE
BORROW PIT
Water
MISSISSIPPI RIVER
CAPE GIRARDEAU COUNTY MISSOURI
SCOTT COUNTY MISSOURI


N
R. 3 W.
(Joins sheet 11)
T. 14 S.
(Joins sheet 20)
(Joins sheet 22)
(Joins sheet 31)
28
27
26
33
34
35
Gale
Sexton Creek
Water
Levee
Illinois Central
Missouri Pacific

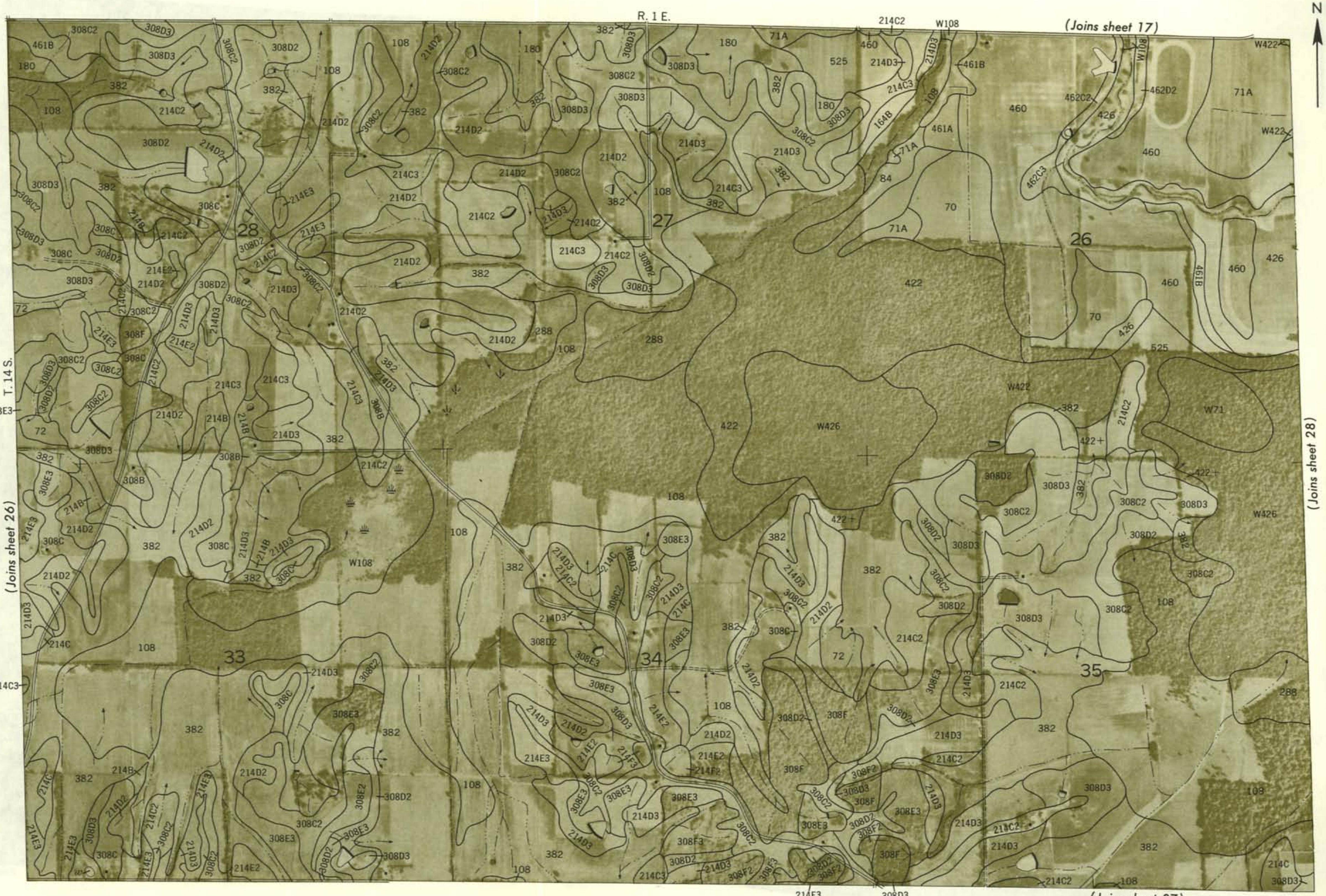

N
(Joins sheet 12)
R. 3 W.
R. 2 W.
(Joins sheet 21)
(Joins sheet 23)
(Joins sheet 32)
T. 14 S.
Sexton
Creek
Blue
Hollow
25
30
29
36
31
32
990G
331
475
308D
308C
308C2
216F
453E3
214E3
471G
990F


N
R. 2 W.
(Joins sheet 13)
(Joins sheet 24)
(Joins sheet 22)
(Joins sheet 33)
T. 14 S.
28
27
26
33
34
35
Sandy
Creek
Sandy
Creek
CEMETERY

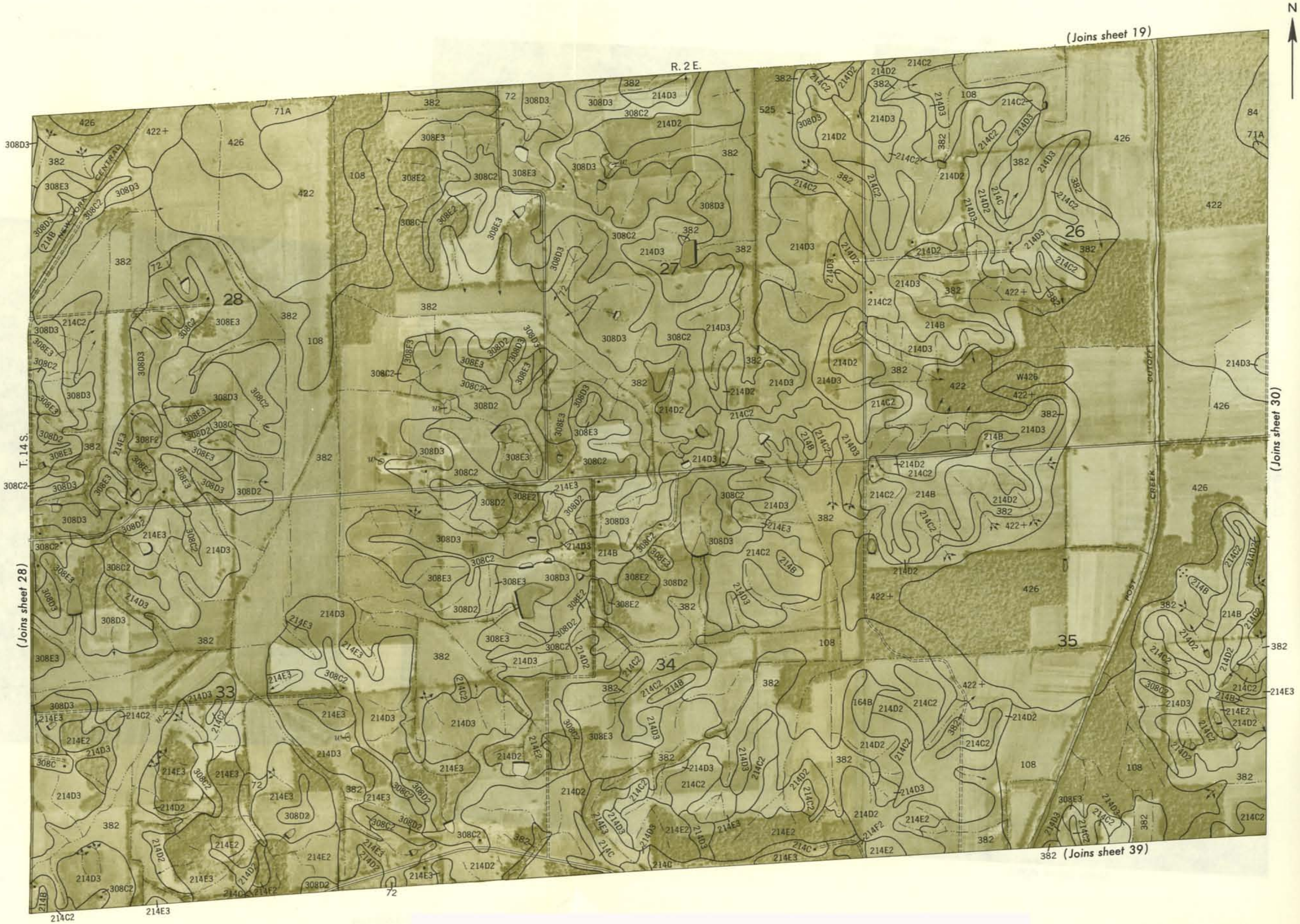

N
(Joins sheet 14)
R. 2 W. | R. 1 W.
(Joins sheet 23)
(Joins sheet 25)
(Joins sheet 34)
T. 14 S.
25
30
29
36
31
32
PULP MILL
SILICA QUARRY
QUARRY
TAMMS
OHIO AND MOBILE GULF
ALEXANDER COUNTY
PULASKI COUNTY
Jackson
Mill Creek
ILLINOIS CENTRAL
CHICAGO AND EASTERN ILLINOIS
127


N
R. 1 W.
(Joins sheet 15)
(Joins sheet 24)
(Joins sheet 26)
(Joins sheet 35)
T. 14 S.
ULLIN
ALEXANDER CO
PULASKI CO
Mill Creek
ILLINOIS CENTRAL
CHICAGO AND EASTERN ILLINOIS
CACHE RIVER
CUTOFF DITCH
Cache River
DUMP
B. P.
28
27
26
33
34
35

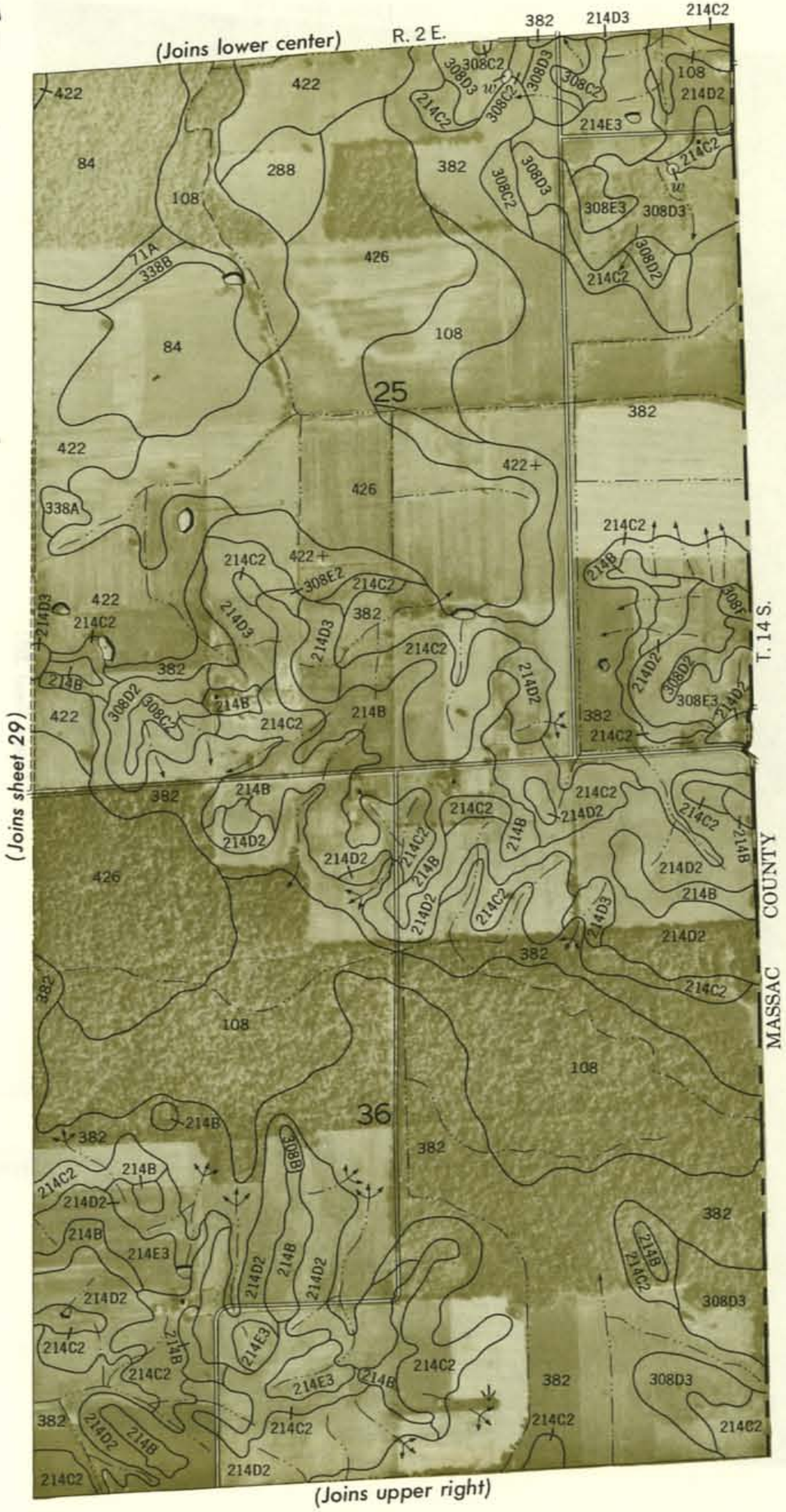

26
(Joins sheet 16)
R. 1 W.
R. 1 E.
N
(Joins sheet 25)
(Joins sheet 27)
(Joins sheet 36)
T. 14 S.
Cache River
INTERSTATE HIGHWAY 57
PROPOSED ROUTE
25
30
29
36
31
32

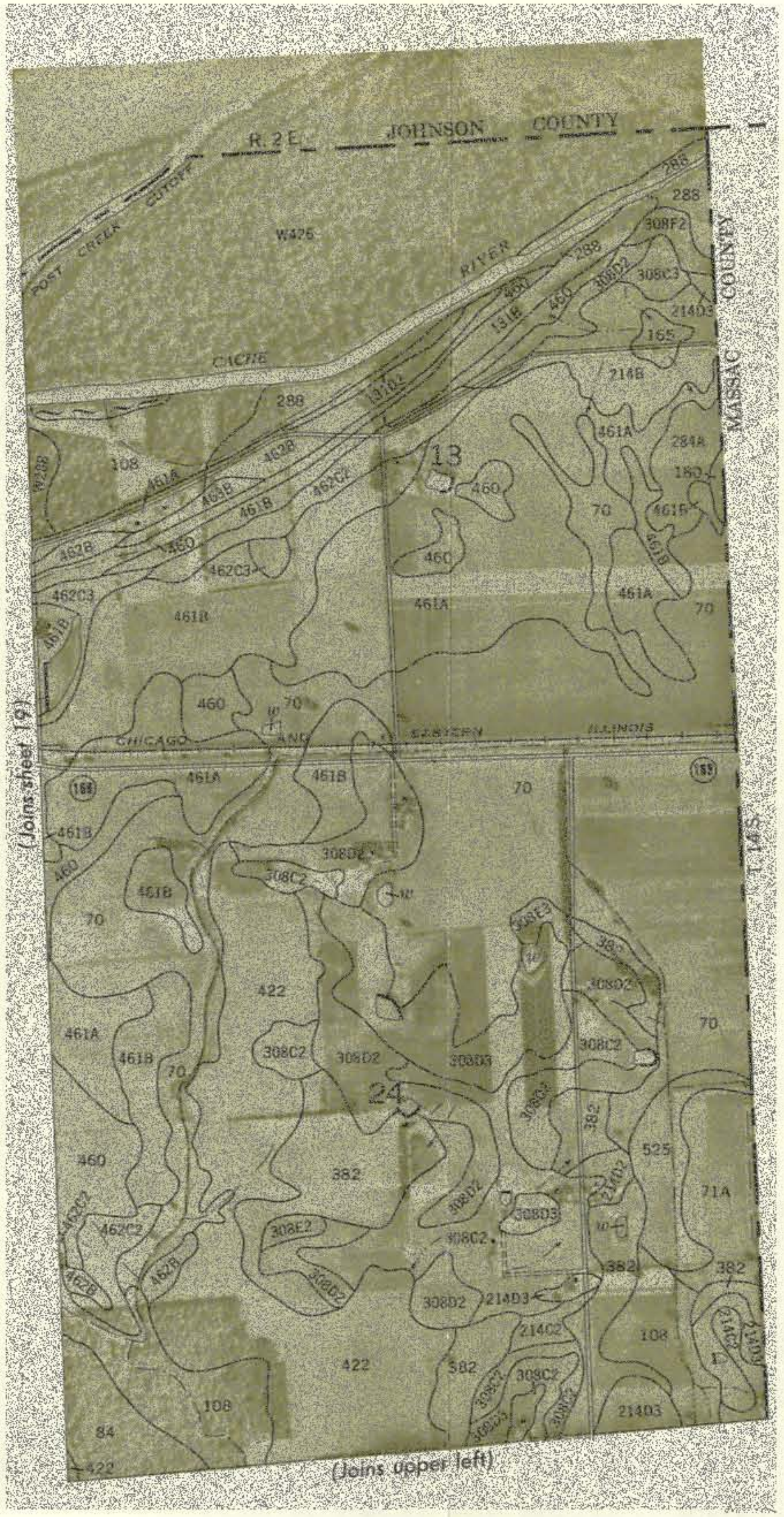

N
R. 1 E.
(Joins sheet 17)
T. 14 S.
(Joins sheet 26)
(Joins sheet 28)
(Joins sheet 37)
28
27
26
33
34
35

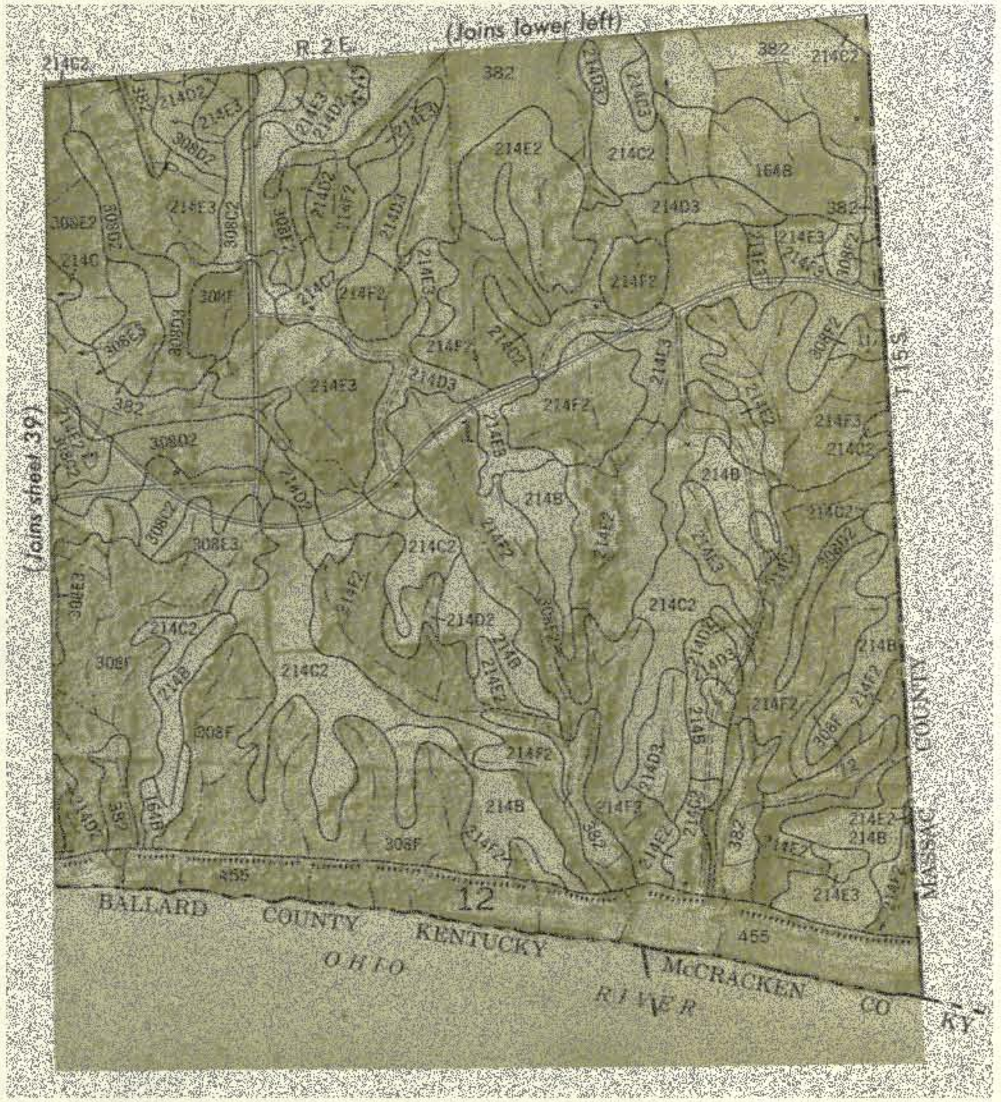

N
(Joins sheet 18)
R. 1 E.
R. 2 E.
T. 14 S.
(Joins sheet 27)
(Joins sheet 29)
(Joins sheet 38)
25
29
30
31
32
36
NEW GRAND CHAIN
NEW YORK CENTRAL
W426
W108
W422
382
308D3
308D2
308E3
308C2
214C2
214D3
214D2
214E3
72
108
109
426
460
422
288
164B
214B
214C


N
(Joins sheet 19)
R. 2 E.
T. 14 S.
(Joins sheet 28)
(Joins sheet 30)
(Joins sheet 39)
NEW YORK CENTRAL
CUTOFF
POST CREEK
26
27
28
33
34
35

N

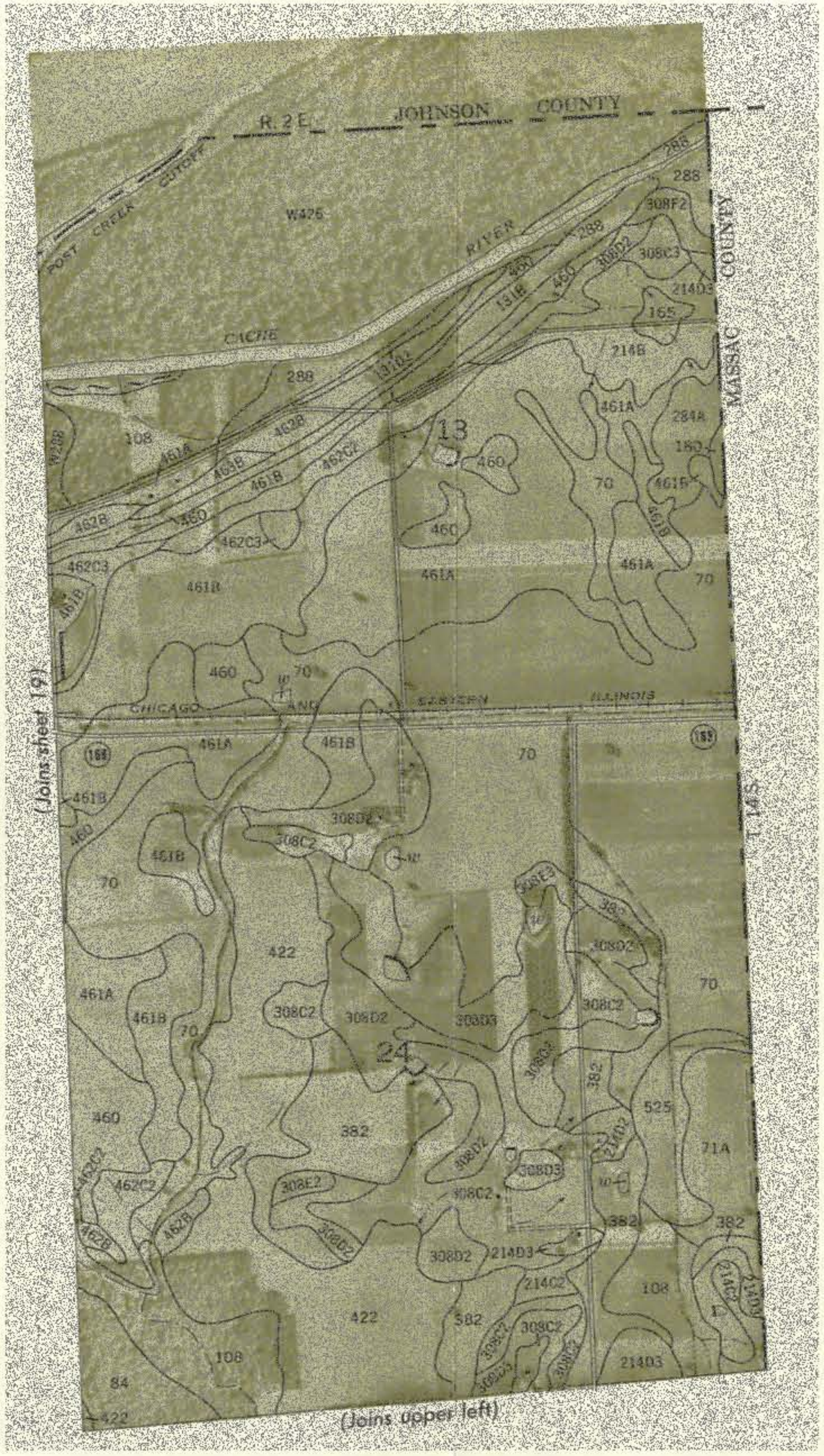

(Joins lower center)
R. 2 E.
(Joins sheet 29)
T. 14 S.
MASSAC COUNTY
25
36
(Joins upper right)

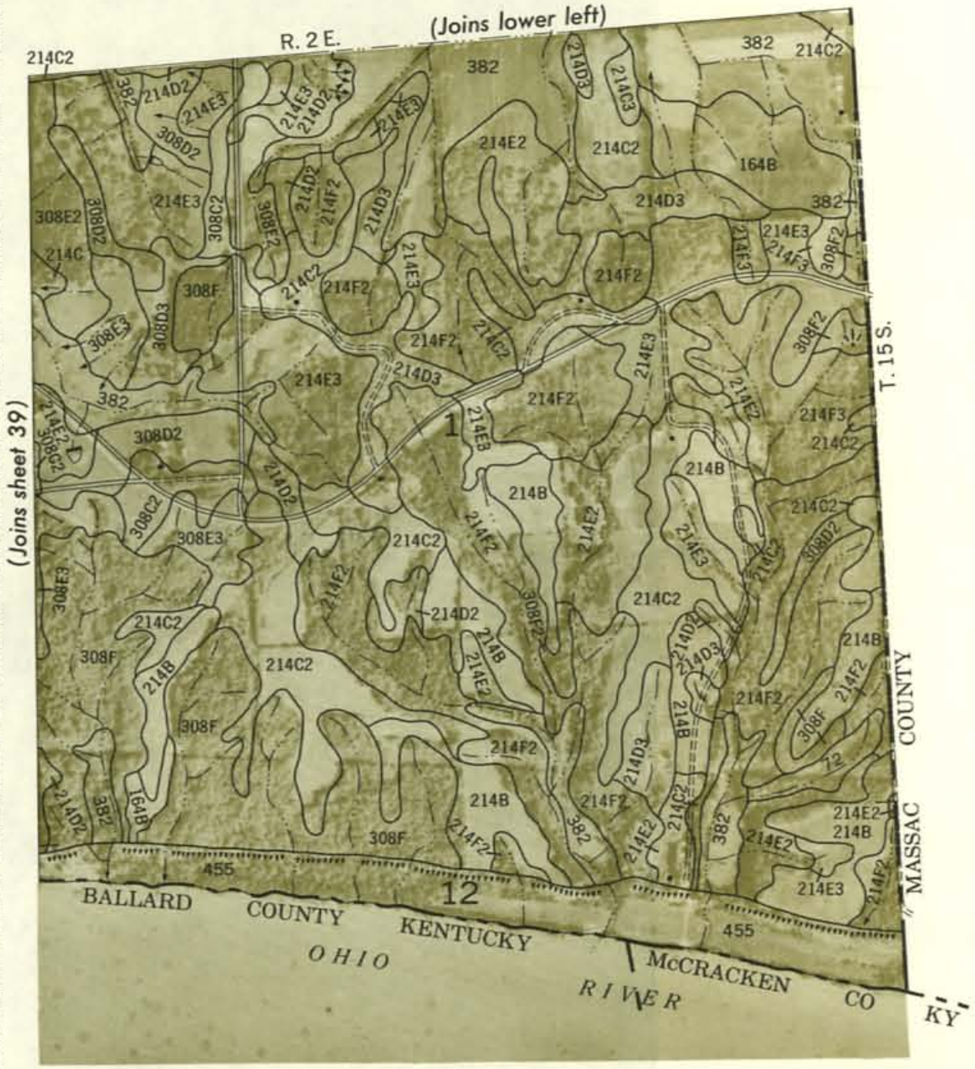

R. 2 E.
JOHNSON COUNTY
POST CREEK CUTOFF
CACHE RIVER
MASSAC COUNTY
13
CHICAGO AND EASTERN ILLINOIS
(Joins sheet 19)
T. 14 S.
24
(Joins upper left)


R. 2 E.
(Joins lower left)
(Joins sheet 39)
T. 15 S.
MASSAC COUNTY
12
BALLARD COUNTY KENTUCKY
OHIO RIVER
McCRACKEN CO
KY

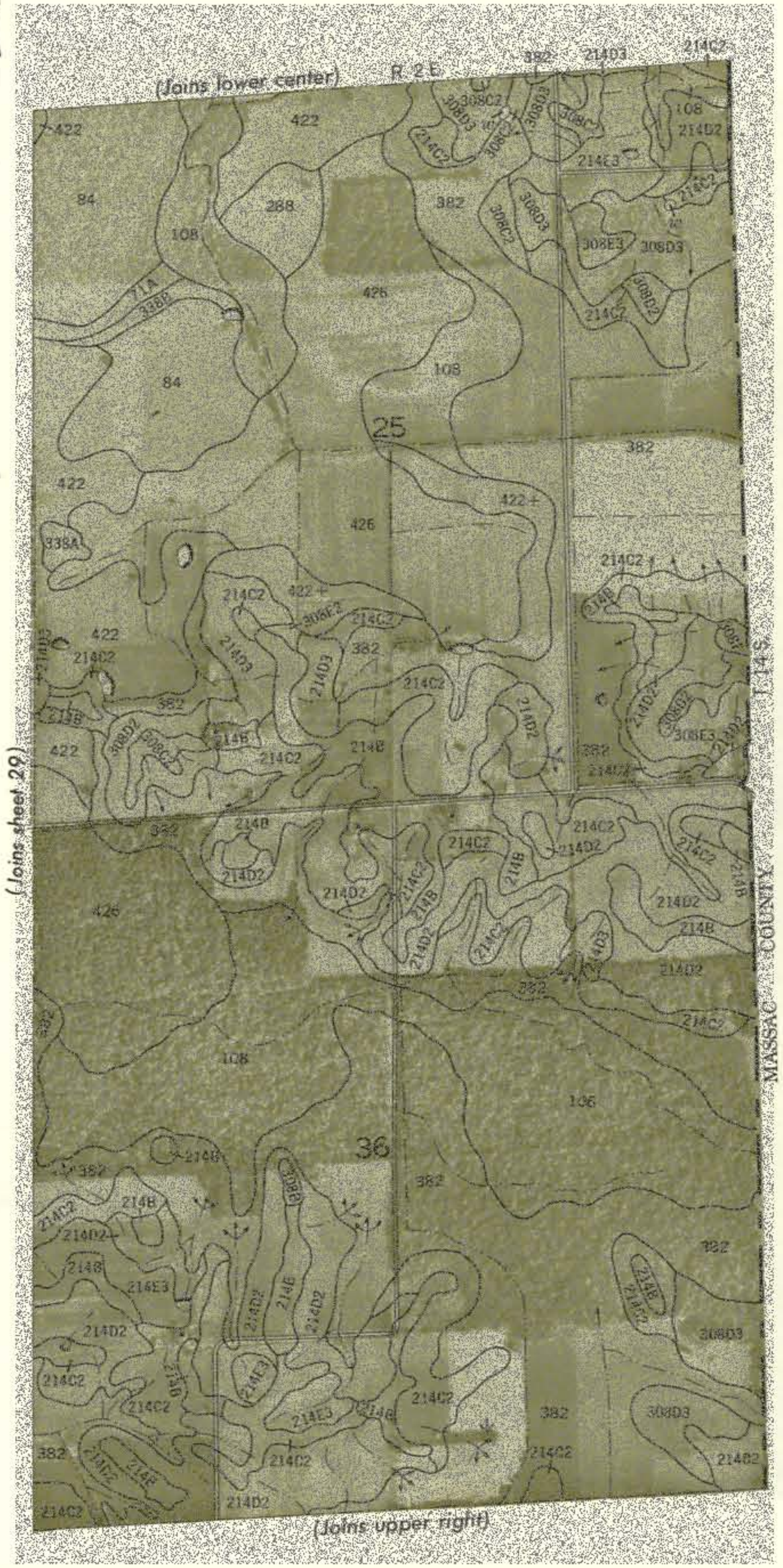
N

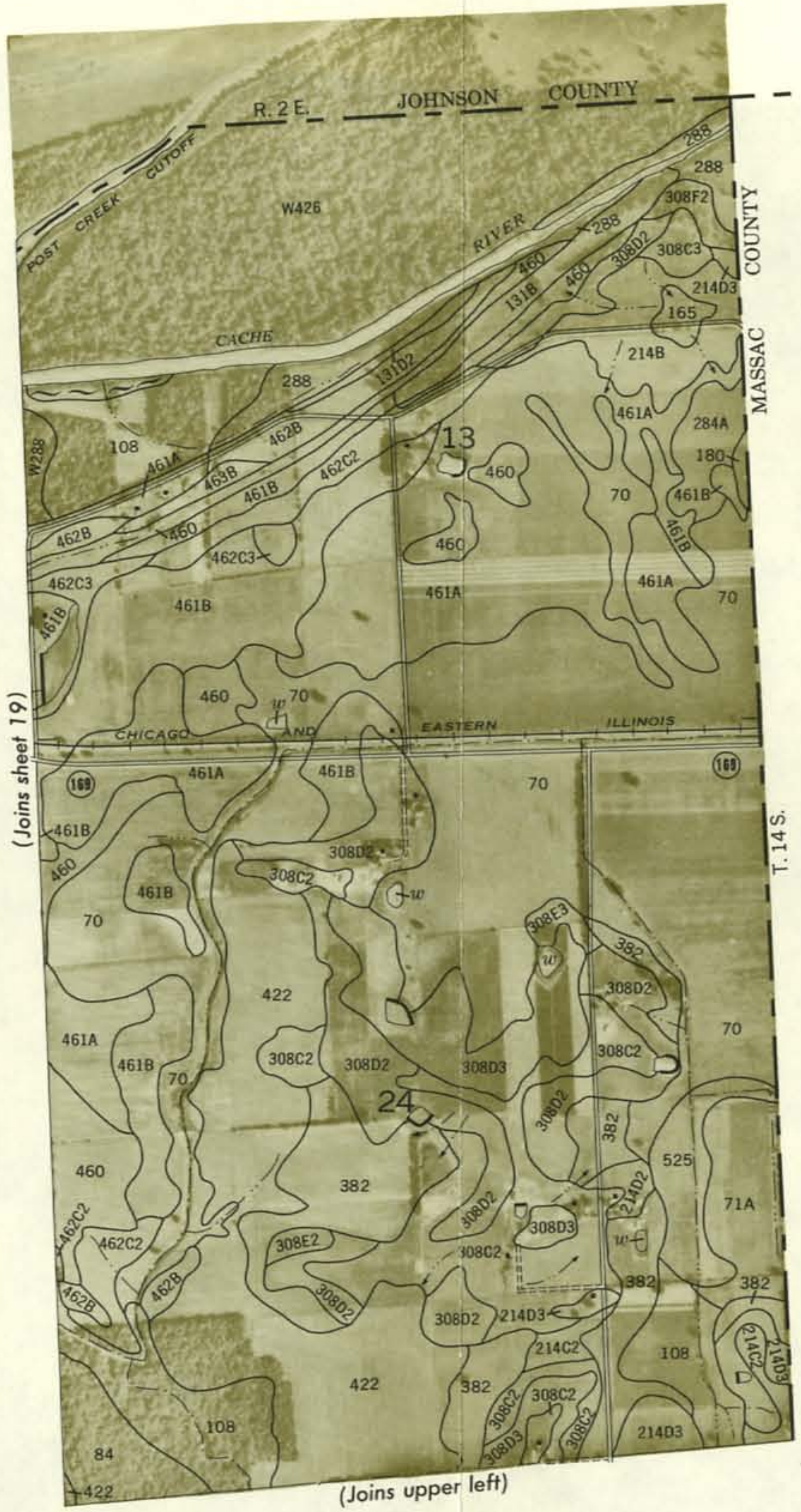

(Joins lower center)
R. 2 E.
25
36
T. 14 S.
MASSAC COUNTY
(Joins sheet 29)
(Joins upper right)

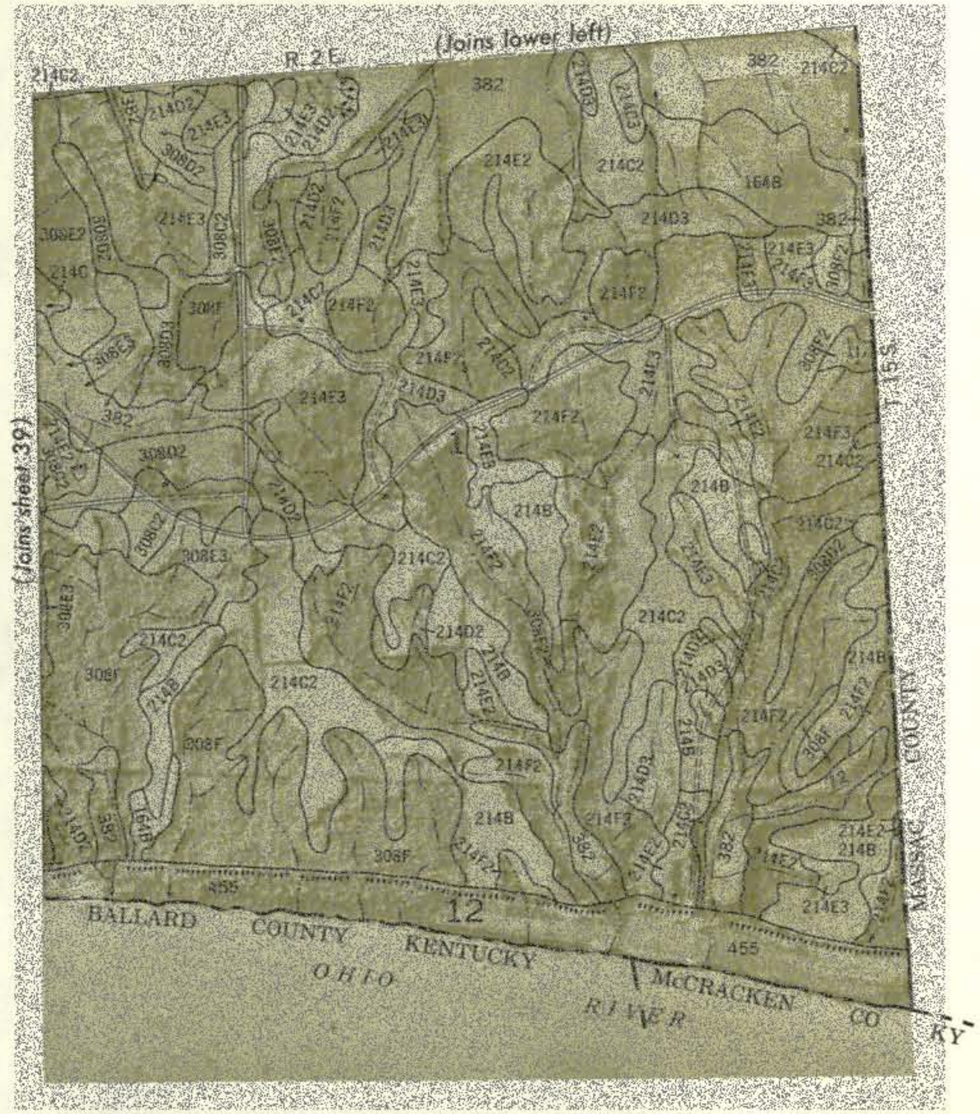

R. 2 E.
JOHNSON COUNTY
POST CREEK CUTOFF
CACHE RIVER
MASSAC COUNTY
13
24
CHICAGO AND EASTERN ILLINOIS
T. 14 S.
(Joins sheet 19)
(Joins upper left)

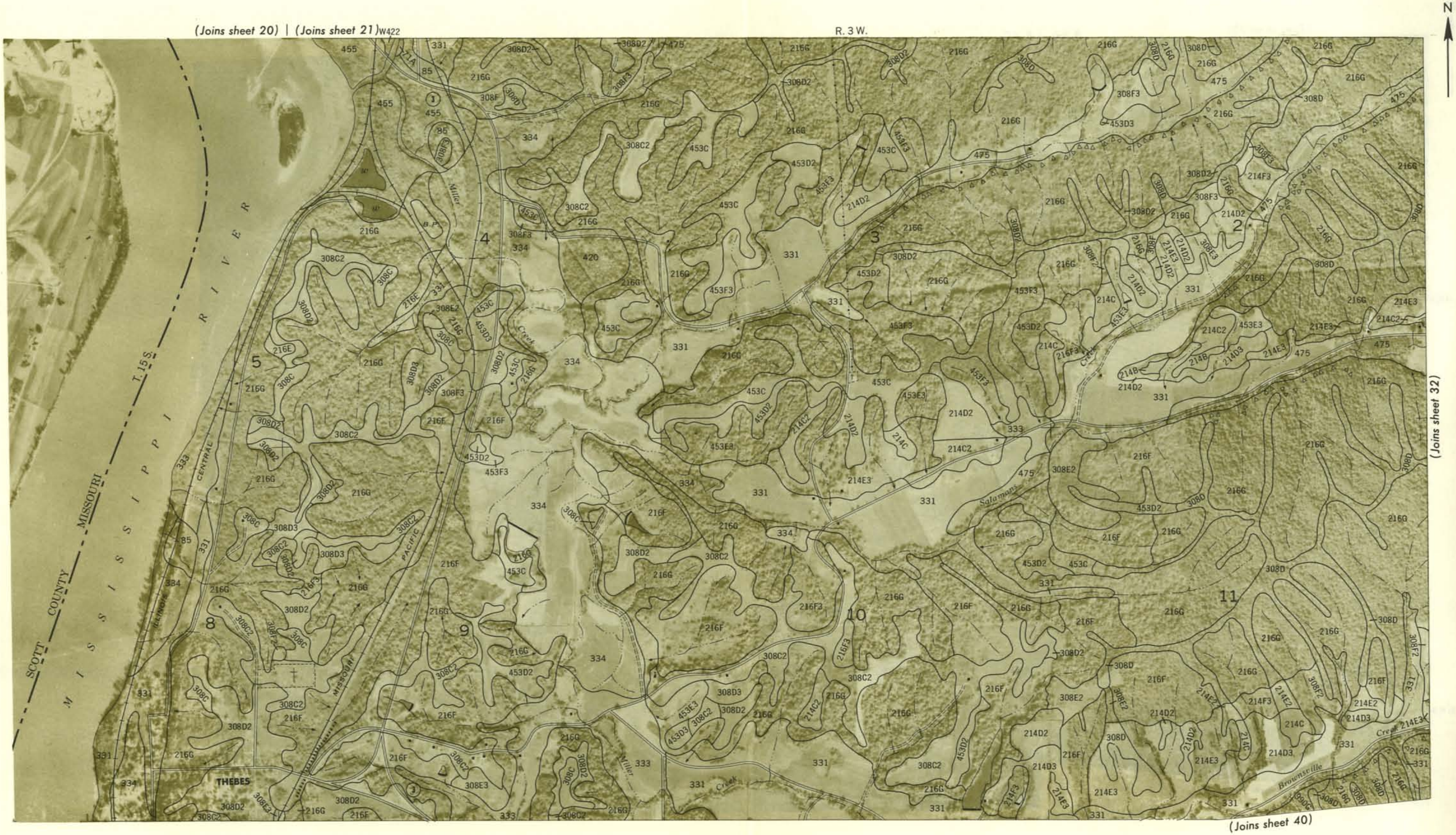

R. 2 E.
(Joins lower left)
T. 15 S.
(Joins sheet 39)
1
12
MASSAC COUNTY
BALLARD COUNTY KENTUCKY
OHIO RIVER
McCRACKEN CO KY

N


(Joins lower center)
R. 2 E.
25
36
T. 14 S.
MASSAC COUNTY
(Joins sheet 29)
(Joins upper right)

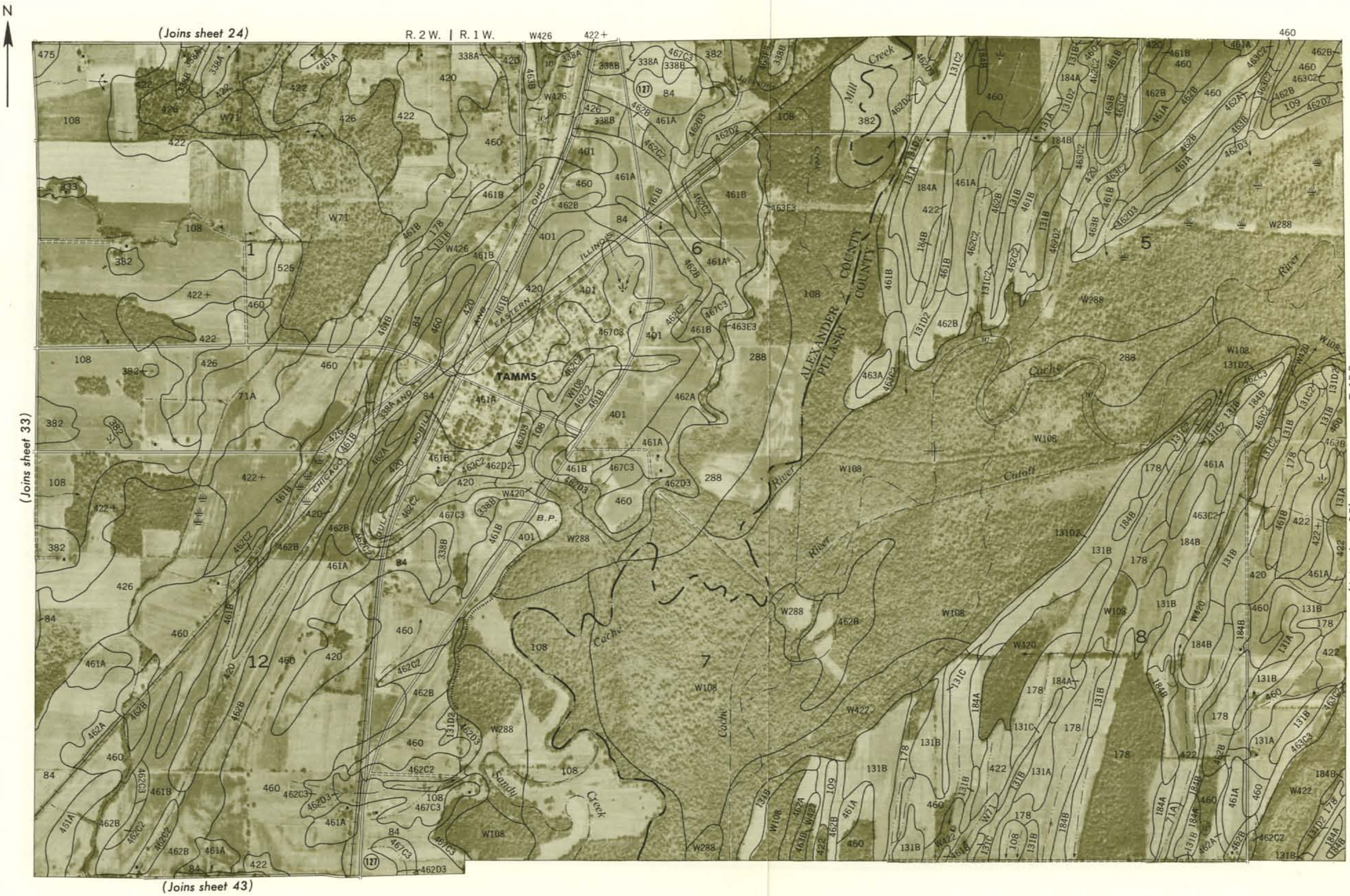

R. 2 E.
JOHNSON COUNTY
POST CREEK CUTOFF
CACHE RIVER
MASSAC COUNTY
13
CHICAGO AND EASTERN ILLINOIS
24
T. 14 S.
(Joins sheet 19)
(Joins upper left)

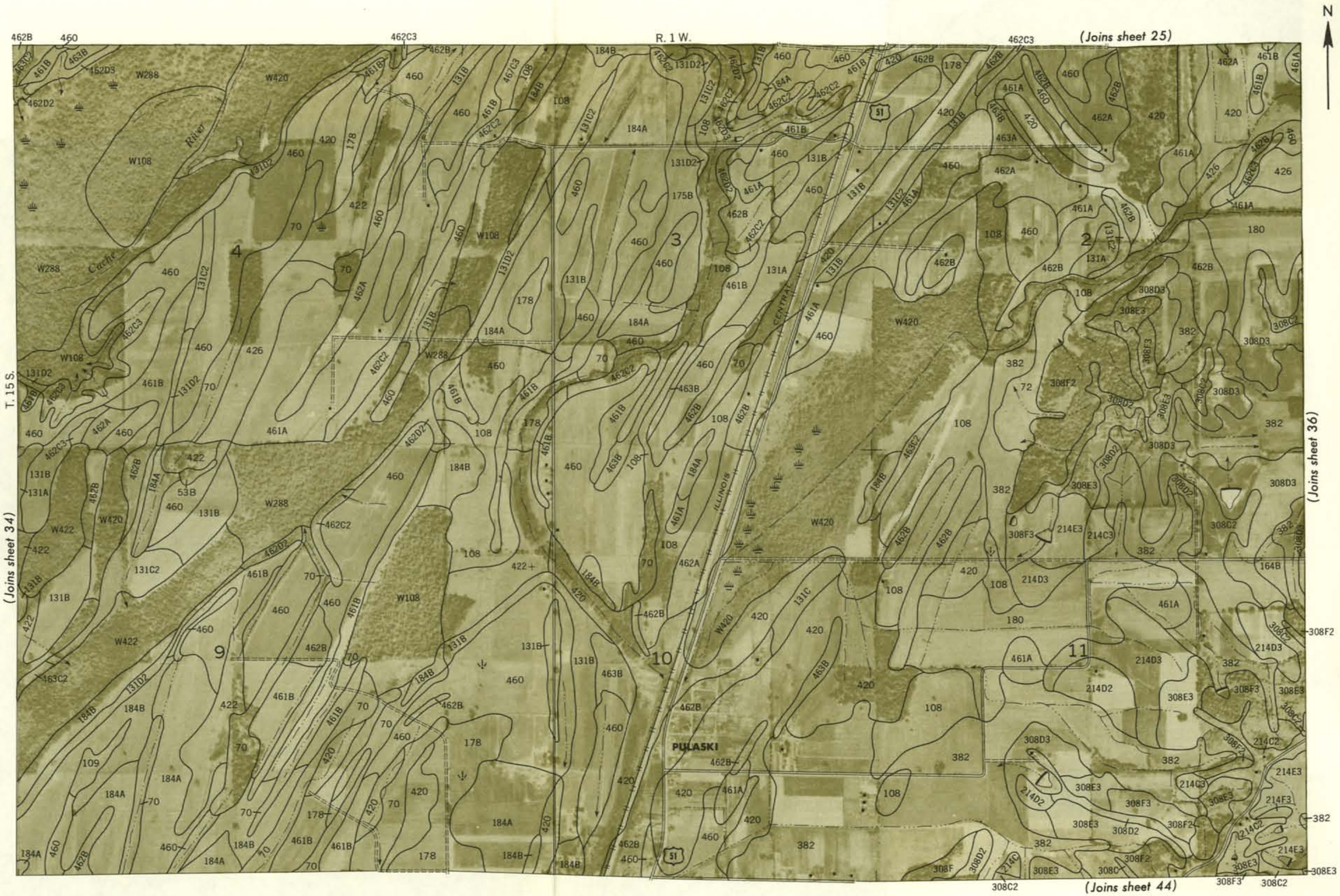

R. 2 E.
(Joins lower left)
(Joins sheet 39)
T. 15 S.
MASSAC COUNTY
12
BALLARD COUNTY KENTUCKY
McCRACKEN CO KY
OHIO RIVER

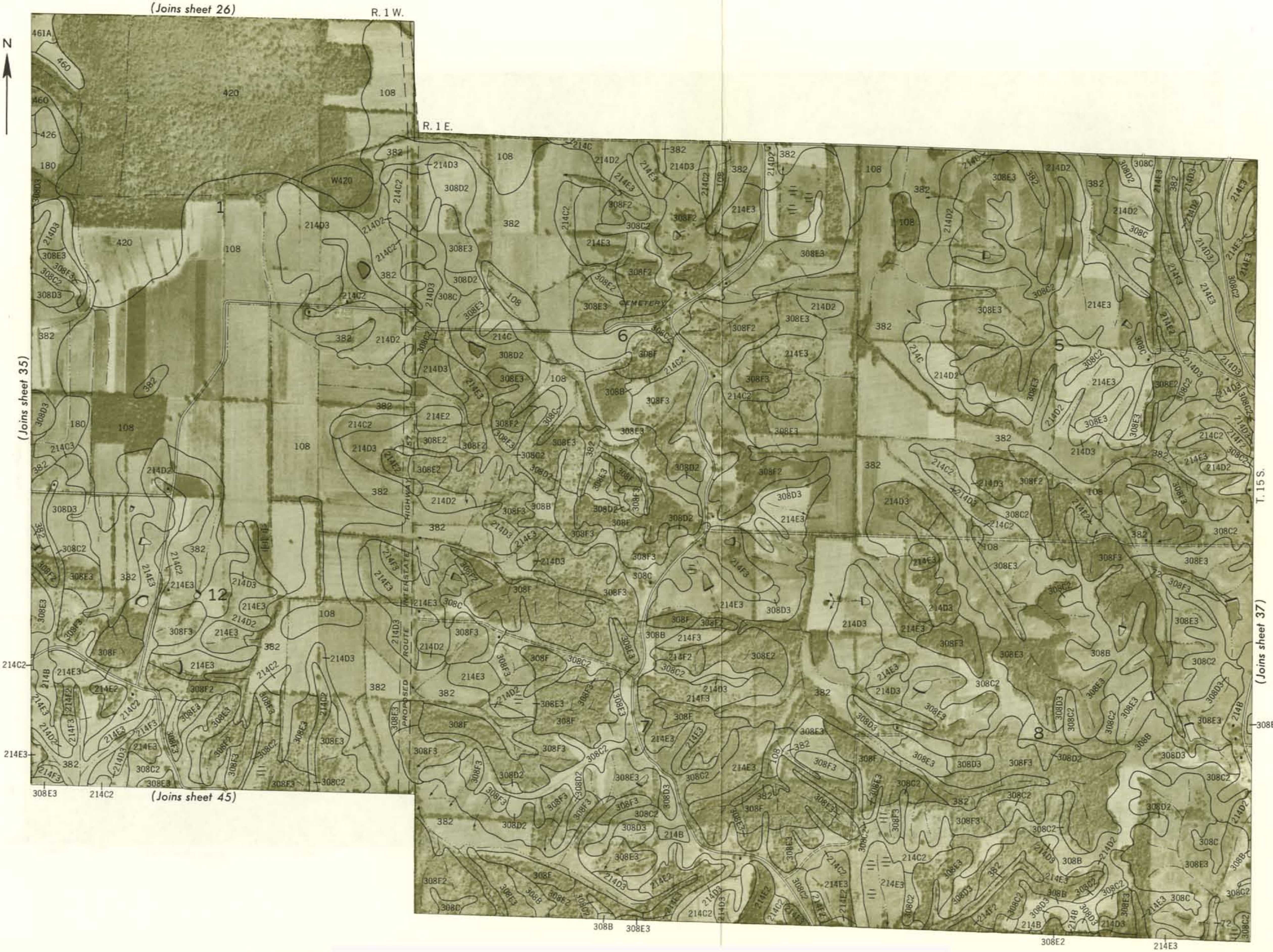

N
(Joins sheet 20) | (Joins sheet 21)
R. 3 W.
(Joins sheet 32)
(Joins sheet 40)
T. 15 S.
MISSISSIPPI RIVER
SCOTT COUNTY
MISSOURI
THEBES
CENTRAL
MISSOURI PACIFIC
Miller Creek
Salamons
Brownsville
Creek


N
(Joins sheet 22)
R. 3 W.
R. 2 W.
(Joins sheet 31)
(Joins sheet 33)
(Joins sheet 41)
T. 15 S.
214E3
214E3
216F
Ambeer
Branch
Creek
Brownsville
HONEY SCHOOL
LOOKOUT TOWER
1
5
6
7
8
12
216G
308D
308C
308C2
308E2
308E3
308D2
471G
990G
990F
475
331
214C
214E2
214C2
214D2
216F3
453C
453E3
453E2
453D2
453F3
214E3
308B
308F2
308F3
214D3


N
R. 2 W.
(Joins sheet 23)
T. 15 S.
(Joins sheet 32)
(Joins sheet 34)
(Joins sheet 42)
Sandy Creek
Ambose
Branch
Wolf Creek
Creek
Diswood
4
3
2
9
10
11


N
(Joins sheet 24)
R. 2 W. | R. 1 W.
(Joins sheet 33)
(Joins sheet 35)
(Joins sheet 43)
T. 15 S.
TAMMS
ILLINOIS
CENTRAL
OHIO
AND
EASTERN
MOBILE
AND
GULF
CHICAGO
B.P.
ALEXANDER COUNTY
PULASKI COUNTY
Mill Creek
Cache River
Cutoff
Sandy Creek
127


N
R. 1 W.
(Joins sheet 25)
(Joins sheet 34)
(Joins sheet 36)
(Joins sheet 44)
T. 15 S.
Cache
River
ILLINOIS
CENTRAL
PULASKI
51

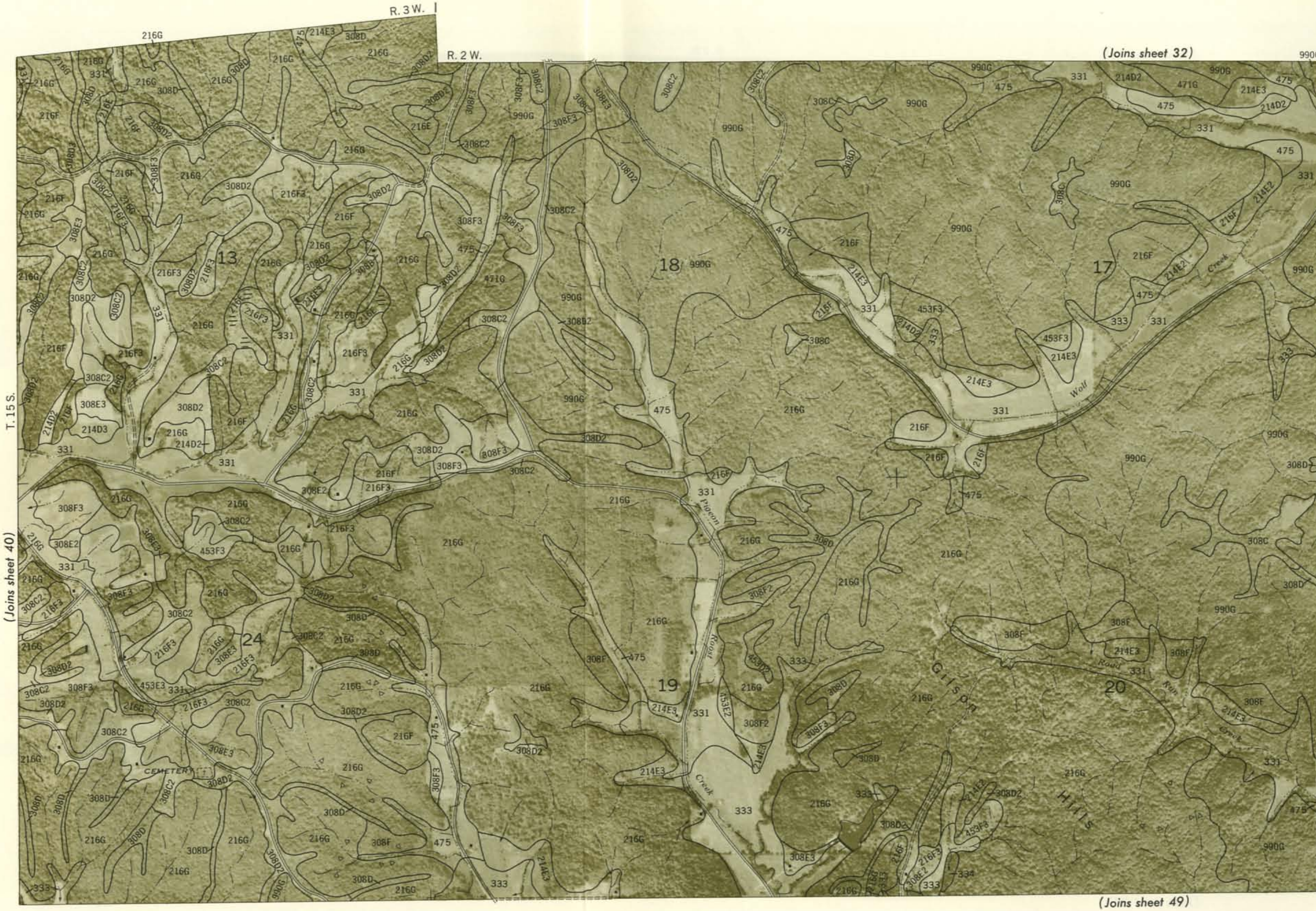

(Joins sheet 26)
N
R. 1 W.
R. 1 E.
(Joins sheet 35)
(Joins sheet 37)
(Joins sheet 45)
T. 15 S.
CEMETERY
PROPOSED INTERSTATE ROUTE HIGHWAY 57
1
5
6
7
8
12
214C2
214E3
308E3
214C2
308B
308E3
308E2
214E3
308E3

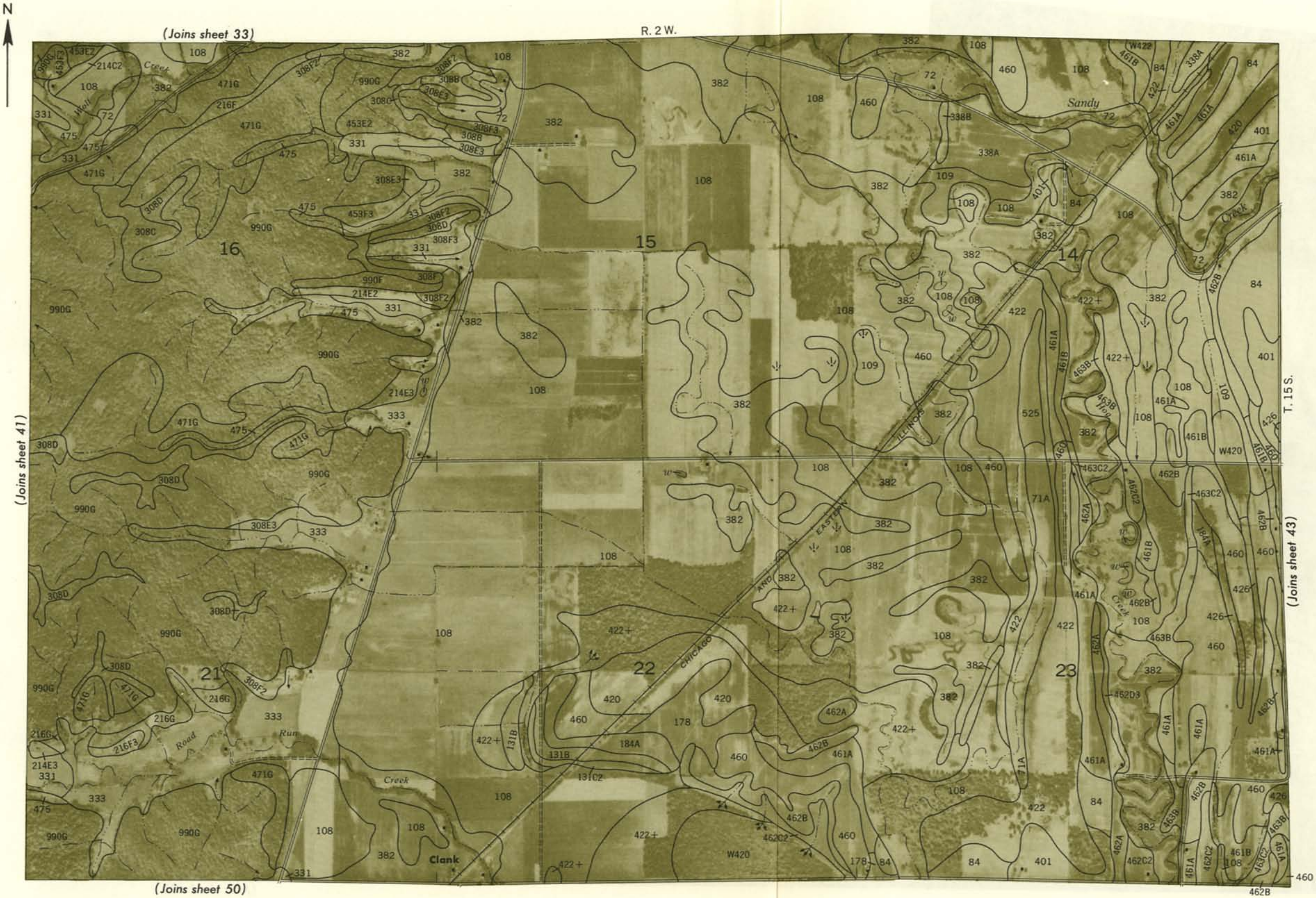

N
R. 1 E.
(Joins sheet 27)
T. 15 S.
(Joins sheet 36)
(Joins sheet 38)
(Joins sheet 46)
4
3
2
9
10
11
37

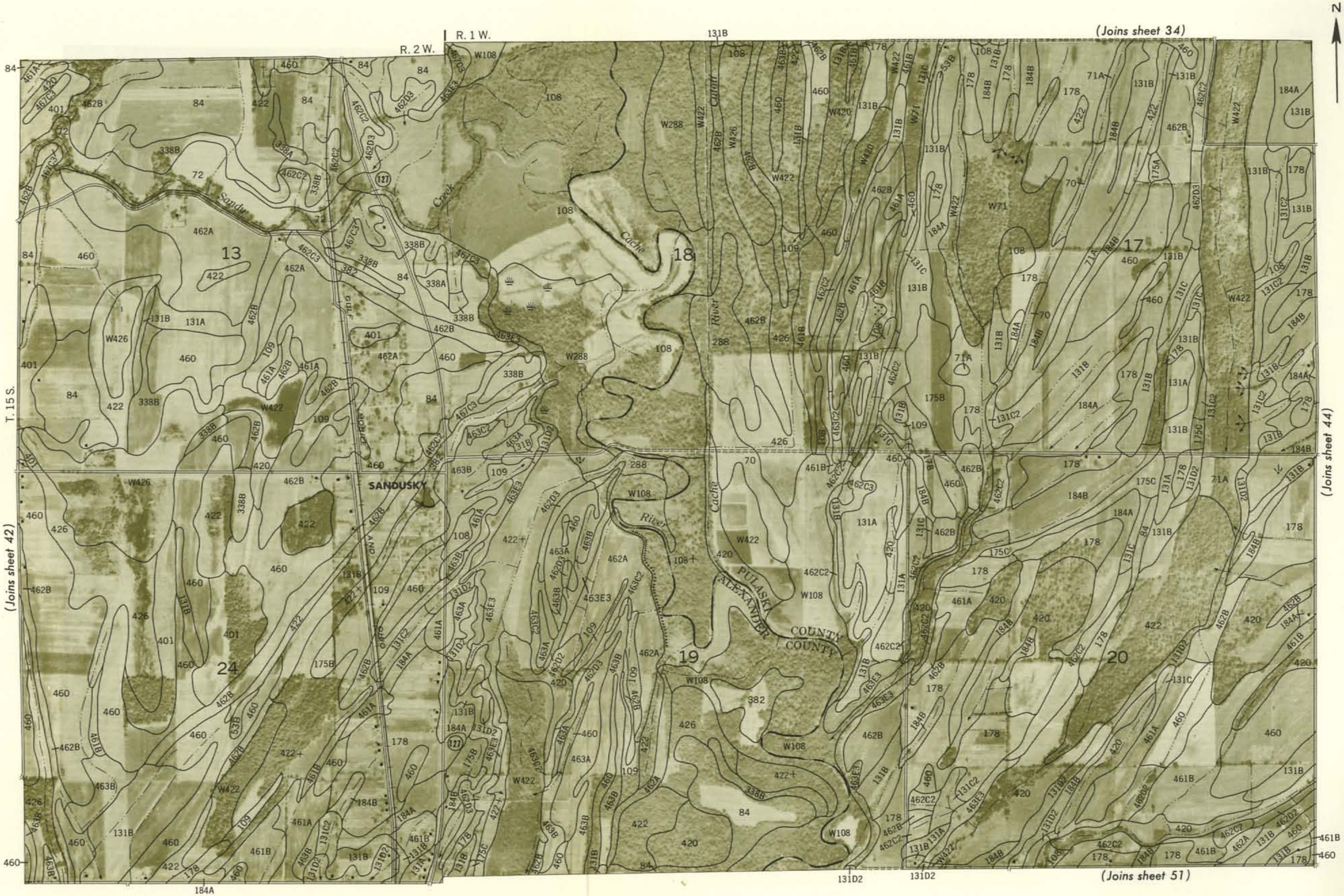

N
(Joins sheet 28)
R. 2 E.
R. 1 E.
T. 15 S.
(Joins sheet 37)
(Joins sheet 39)
(Joins sheet 47)
NEW YORK CENTRAL
BALLARD COUNTY
KENTUCKY
OHIO RIVER
1
5
6
7
8
12

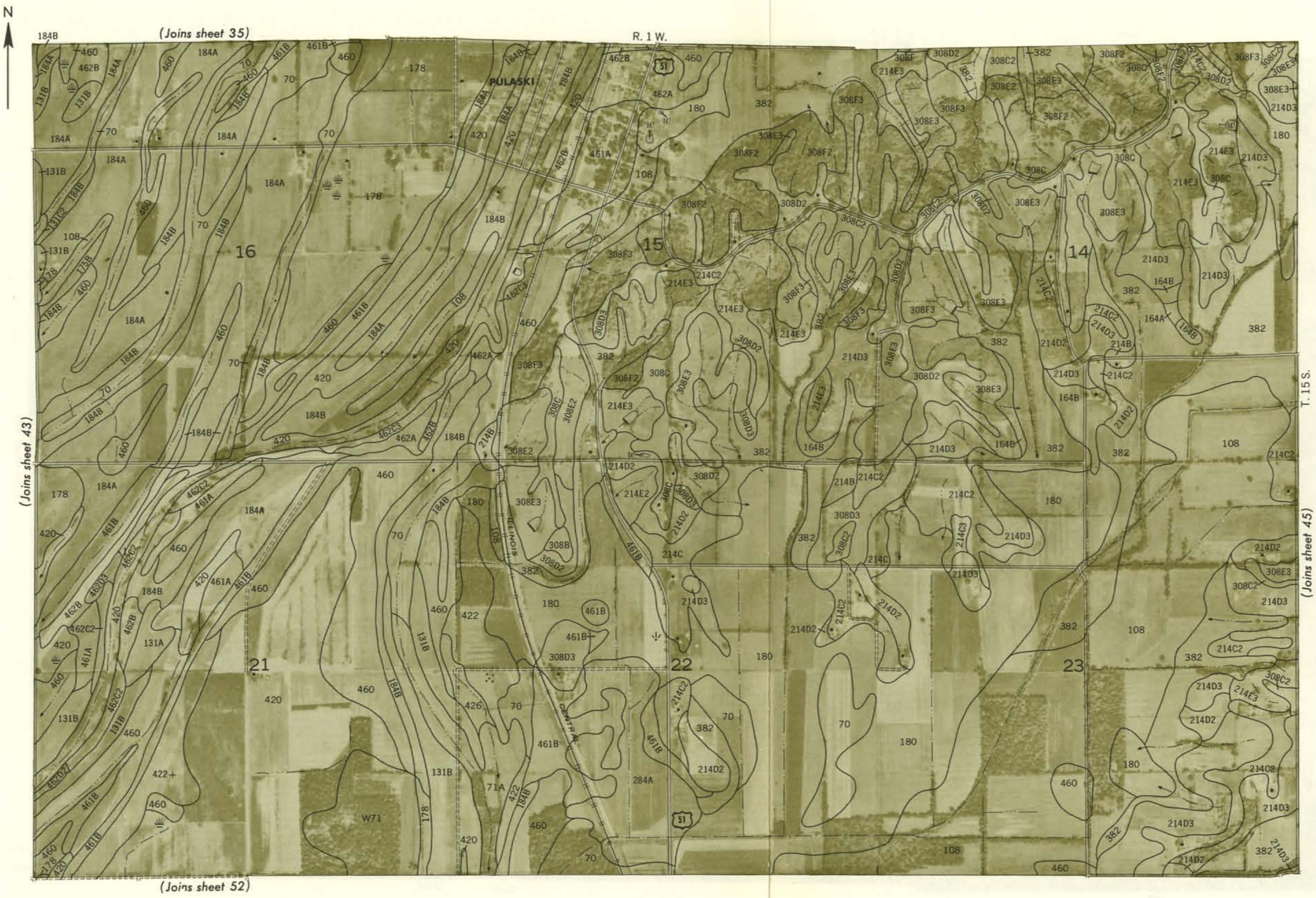

(Joins sheet 29)
(Joins inset, sheet 30)
(Joins sheet 38)
N
R. 2 E.
T. 15 S.
SPOIL BANK
POST CREEK CUTOFF
BALLARD COUNTY
KENTUCKY
O H I O R I V E R
455
382
308F
214D2
214E2
214C2
214B

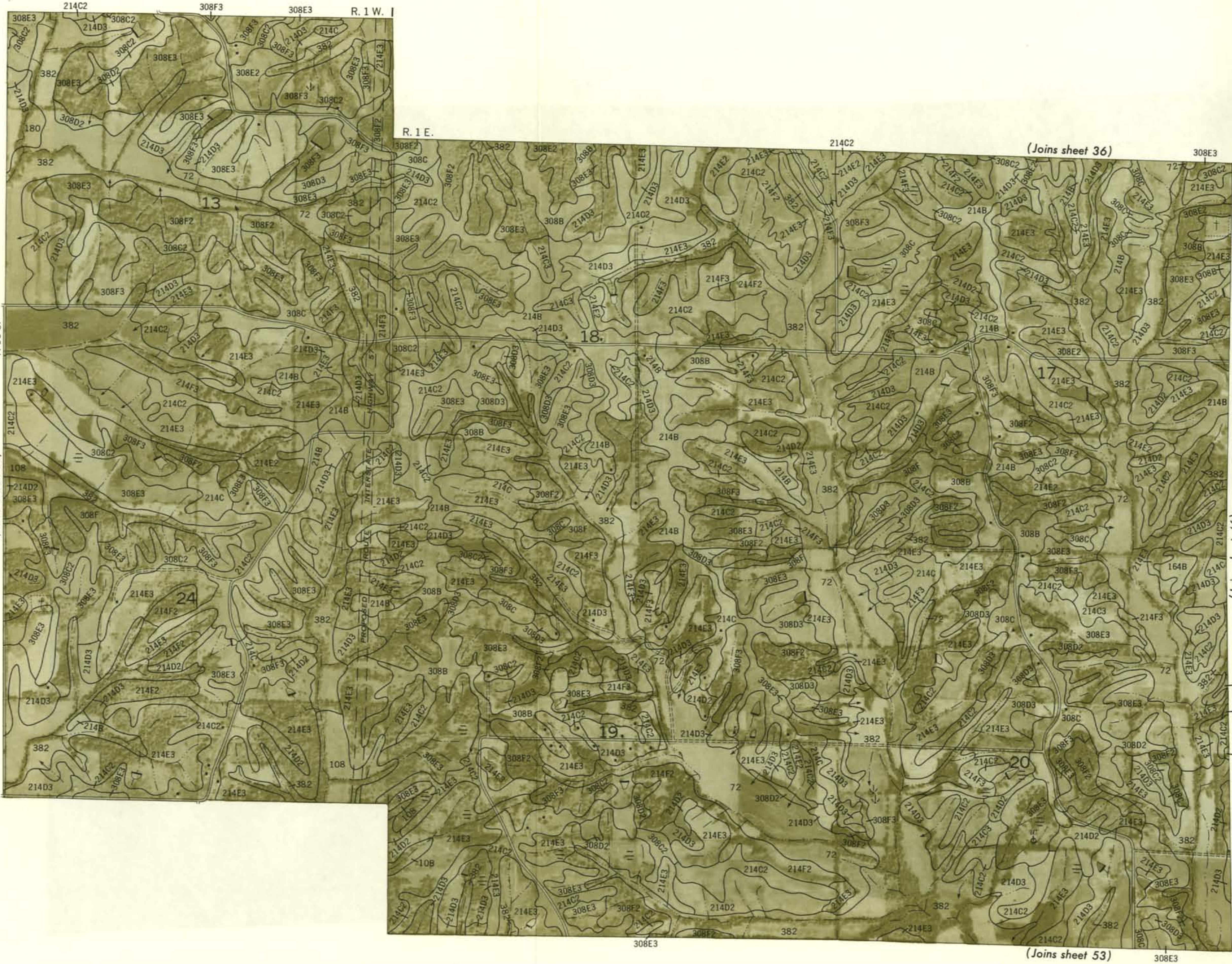

N
R. 3 W.
(Joins sheet 31)
(Joins sheet 41)
(Joins sheet 48)
T. 15 S.
THEBES
MISSISSIPPI RIVER
SCOTT COUNTY
MISSOURI
ILLINOIS
MISSOURI PACIFIC
CHICAGO AND EASTERN ILLINOIS
Brownsville Creek
Miller Creek
Orchard Creek
14
15
16
17
20
21
22
23


R. 3 W.
R. 2 W.
(Joins sheet 32)
(Joins sheet 42)
(Joins sheet 49)
(Joins sheet 40)
T. 15 S.
N
13
18
17
24
19
20
Wolf Creek
Pigeon Roost Creek
Gilson Hills
CEMETERY


N
(Joins sheet 33)
R. 2 W.
(Joins sheet 41)
T. 15 S.
(Joins sheet 43)
(Joins sheet 50)
Wolf Creek
Sandy Creek
Hog Creek
Road Run Creek
ILLINOIS
CHICAGO AND EASTERN
Clank
14
15
16
21
22
23


N
(Joins sheet 34)
(Joins sheet 44)
(Joins sheet 42)
(Joins sheet 51)
R. 2 W.
R. 1 W.
T. 15 S.
SANDUSKY
Sandy
Creek
Cache
River
Cutoff
PULASKI
ALEXANDER
COUNTY
COUNTY
13
17
18
19
20
24

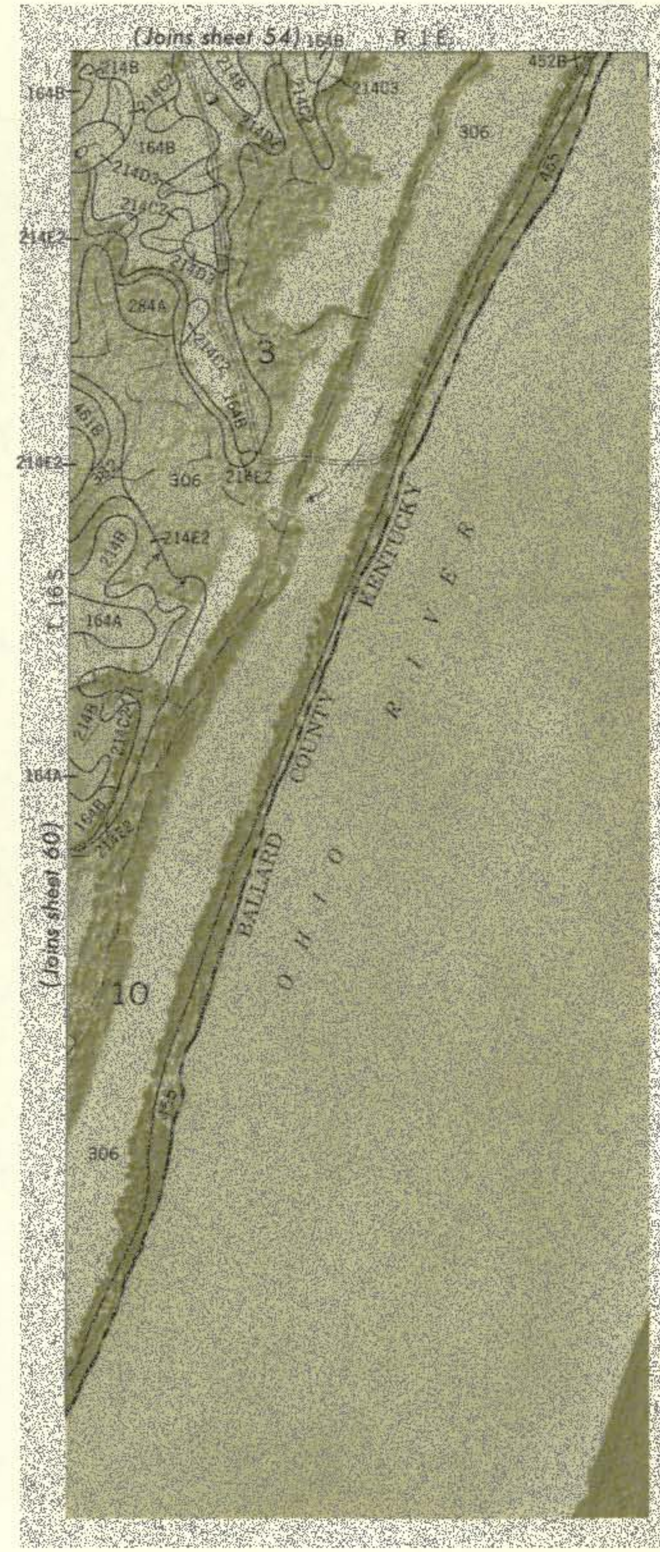

N
(Joins sheet 35)
R. 1 W.
PULASKI
16
15
14
T. 15 S.
(Joins sheet 43)
(Joins sheet 45)
21
22
23
ILLINOIS
CENTRAL
(Joins sheet 52)


N
R. 1 W.
R. 1 E.
T. 15 S.
(Joins sheet 36)
(Joins sheet 44)
(Joins sheet 46)
(Joins sheet 53)
13
18
17
24
19
20


N
(Joins sheet 37)
(Joins sheet 45)
(Joins sheet 47)
(Joins sheet 54)
R. 1 E.
T. 15 S.
16
15
14
21
22
23
OLMSTED
NEW YORK CENTRAL
BALLARD COUNTY KY
OHIO RIVER

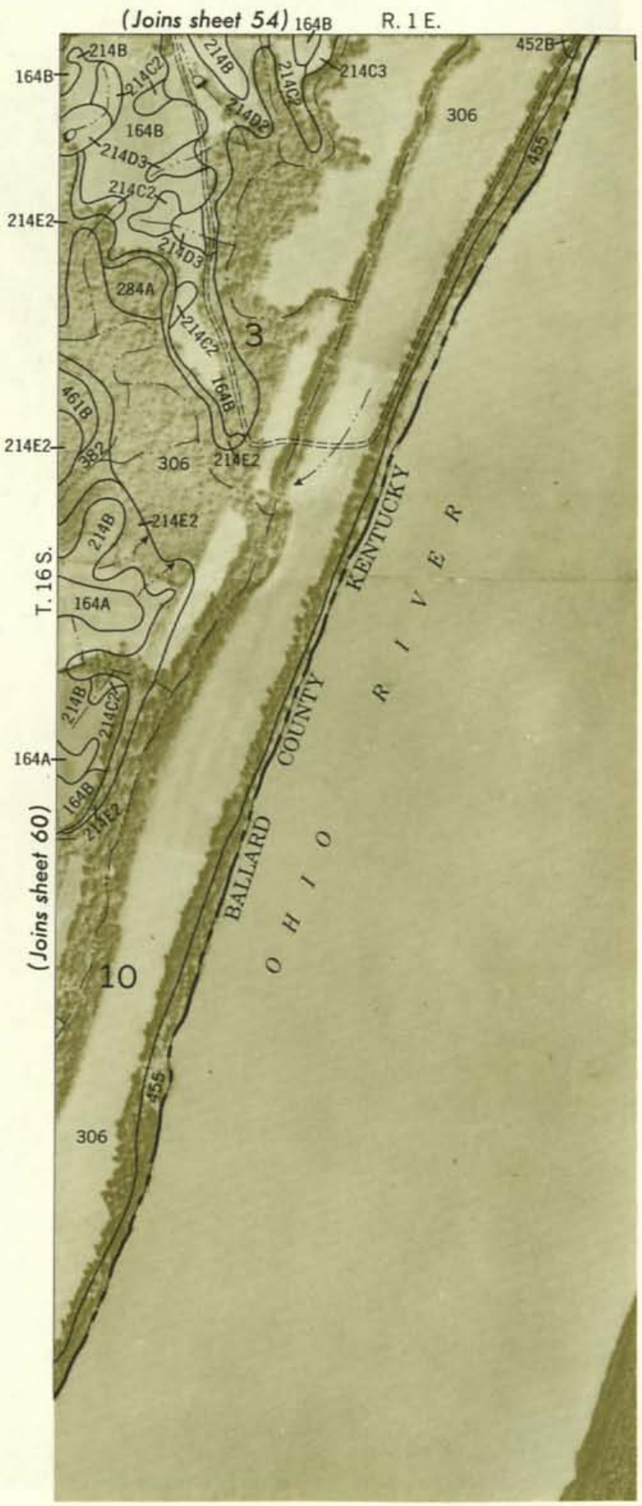
N


(Joins sheet 38)
R. 1 E. | R. 2 E.
(Joins sheet 46)
T. 15 S.
13
18
24
LOCK AND DAM NO. 53
BALLARD COUNTY
KENTUCKY
OHIO RIVER
214D3
308E3
214C2
214D2
214B
214C
214E3
214F2
990G
382
333
308C
308D2
308D3
308B
308C2
455
214E2


(Joins sheet 54)
R. 1 E.
(Joins sheet 60)
T. 16 S.
3
10
452B
164B
214D3
214C2
214E2
284A
164A
306
455
BALLARD COUNTY
KENTUCKY
OHIO RIVER

N


(Joins sheet 38)
R 1 E. | R 2 E.
T 15 S.
(Joins sheet 46)
13
18
24
LOCK AND DAM NO. 53
BALLARD COUNTY KENTUCKY
OHIO RIVER
455
382
214C2
214D3
214E3
308C
308B
990G


(Joins sheet 54)
R. 1 E.
T. 16 S.
(Joins sheet 60)
164B
214B
214C2
214C3
214D3
214E2
284A
164A
461B
382
452B
306
455
3
10
BALLARD COUNTY KENTUCKY
OHIO RIVER

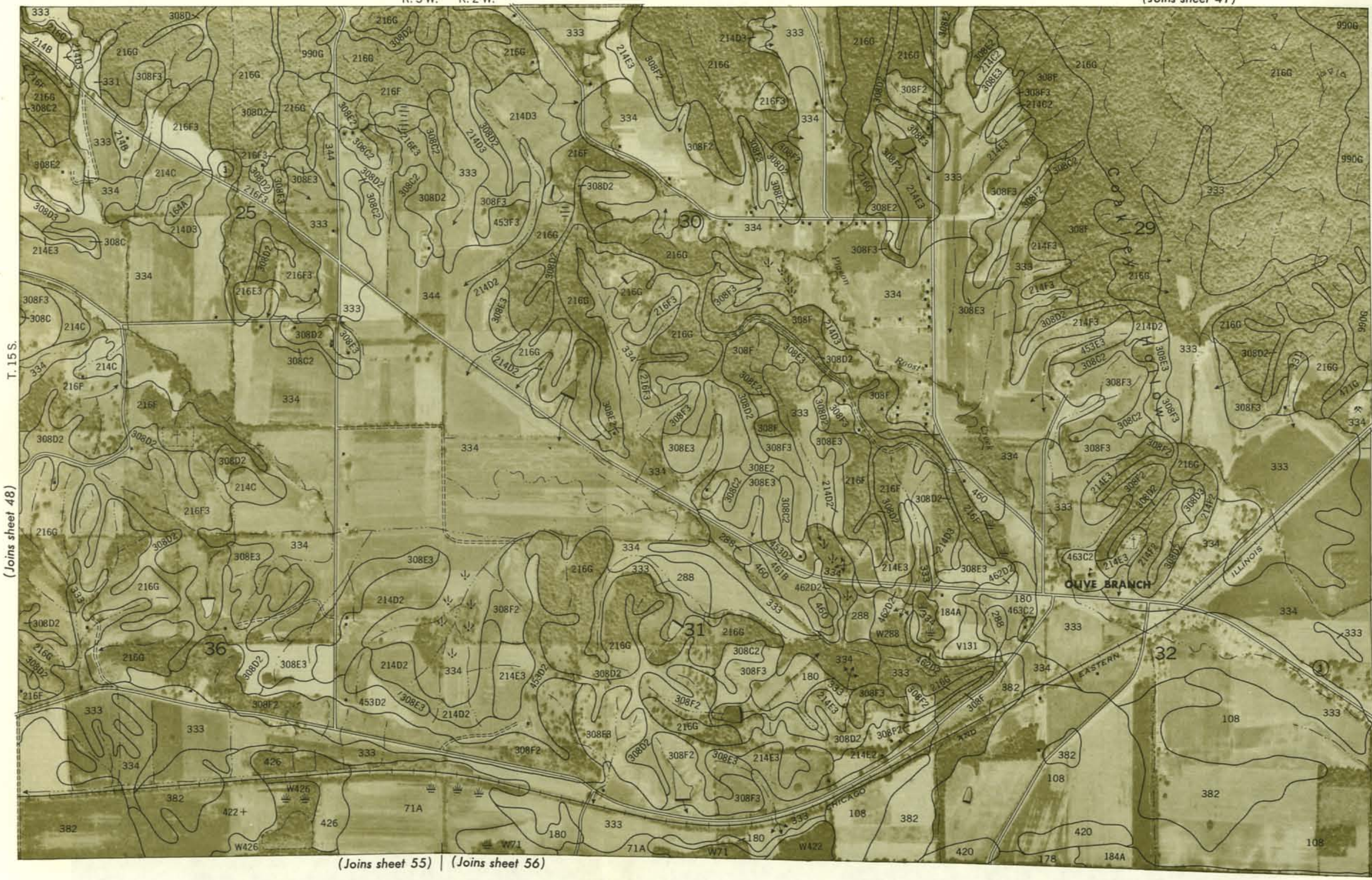
N


R. 3 W.
(Joins sheet 40)
T. 15 S.
(Joins sheet 49)
(Joins sheet 55)
MISSISSIPPI RIVER
SCOTT COUNTY
MISSOURI
MISSOURI PACIFIC
CHICAGO AND EASTERN ILLINOIS
Santa Fe Hills
Orchard Creek
SURVEY NO. 526
Fayville
BURNHAM ISLAND
28
27
26
33
34
35
455
990G
216F
216G
216E
308C
308C2
308D
308D2
308D3
308E2
308E3
308F
308F2
308F3
331
333
334
382
453C
453E2
453E3
453F3
461B
462B
462C2
475
75D
108
422
72
214B
214D2
214E3
304A

N

R. 3 W. R. 2 W.

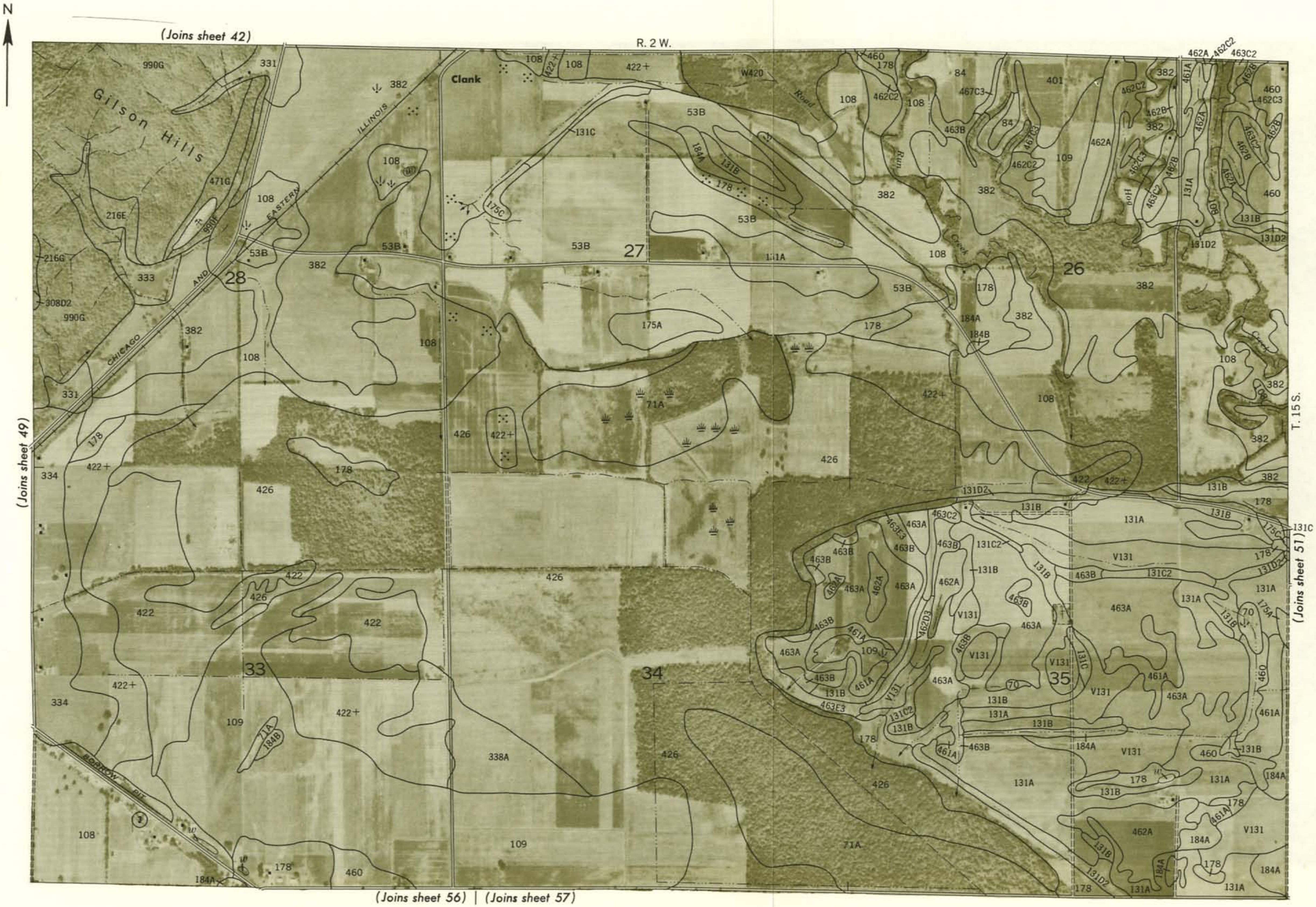
(Joins sheet 41)

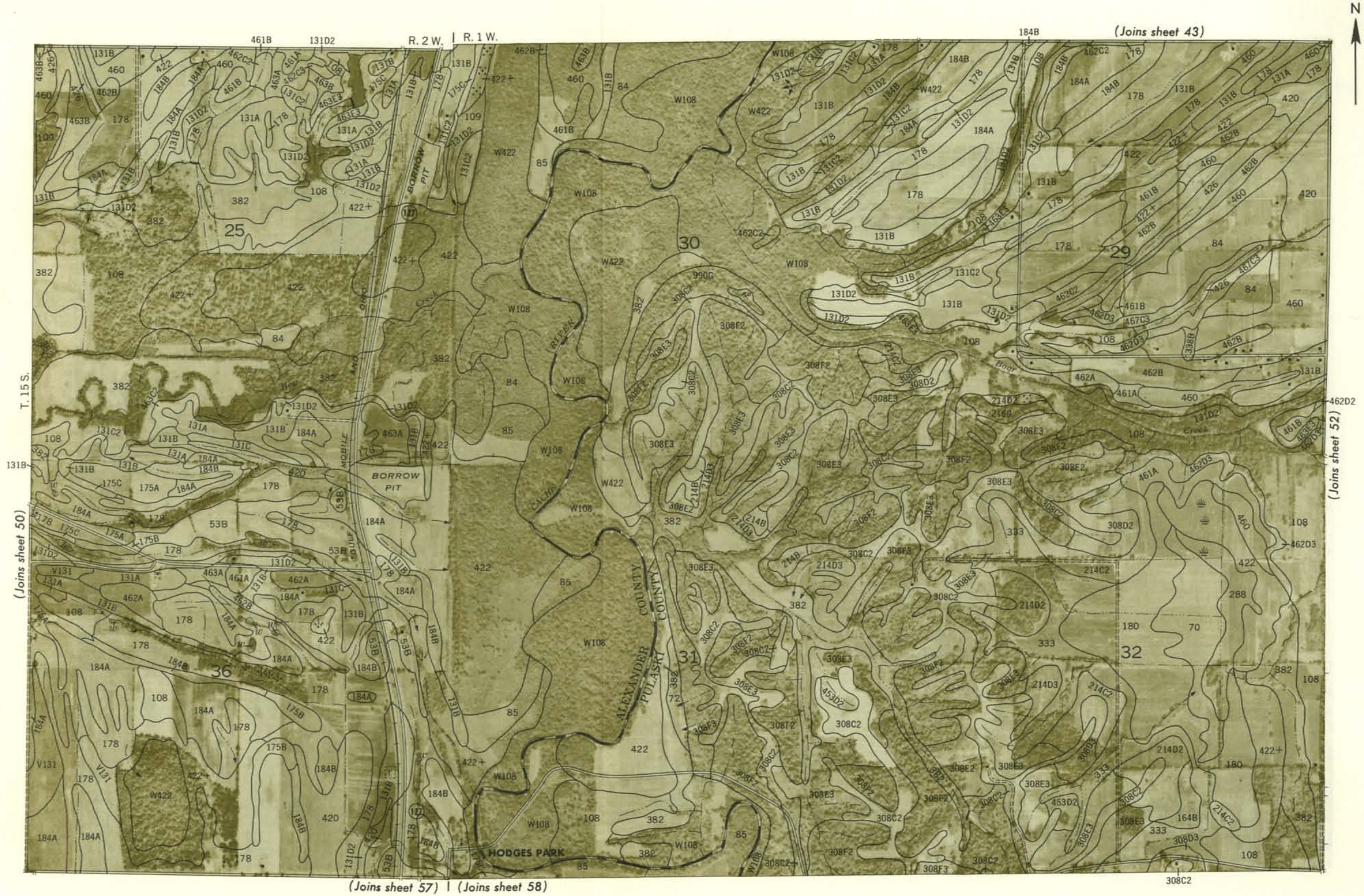


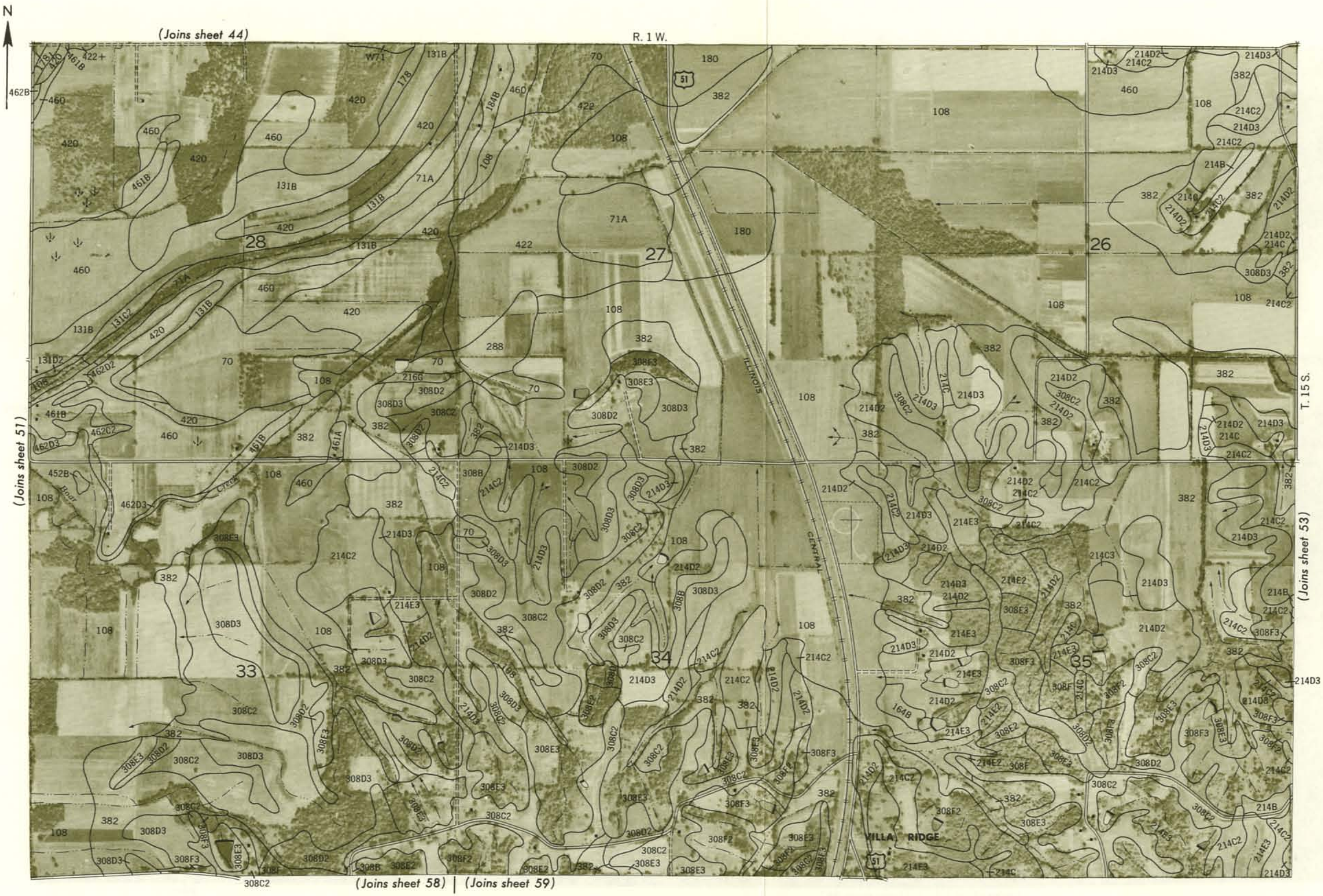
(Joins sheet 48)

(Joins sheet 50)

(Joins sheet 55) | (Joins sheet 56)


N
(Joins sheet 42)
R. 2 W.
T. 15 S.
(Joins sheet 49)
(Joins sheet 51)
(Joins sheet 56) | (Joins sheet 57)
Gilson Hills
Clank
ILLINOIS
CHICAGO
AND
EASTERN
BORROW PIT
Road
Run
Creek
27
26
28
33
34
35


N
(Joins sheet 43)
R. 2 W.
R. 1 W.
T. 15 S.
(Joins sheet 50)
(Joins sheet 52)
(Joins sheet 57)
(Joins sheet 58)
25
30
29
36
31
32
BORROW PIT
CACHE RIVER
MOBILE AND OHIO
Creek
ALEXANDER COUNTY
PULASKI COUNTY
HODGES PARK


N
(Joins sheet 44)
R. 1 W.
T. 15 S.
(Joins sheet 51)
(Joins sheet 53)
(Joins sheet 58)
(Joins sheet 59)
28
27
26
33
34
35
ILLINOIS
CENTRAL
VILLA RIDGE
51
Cross Creek

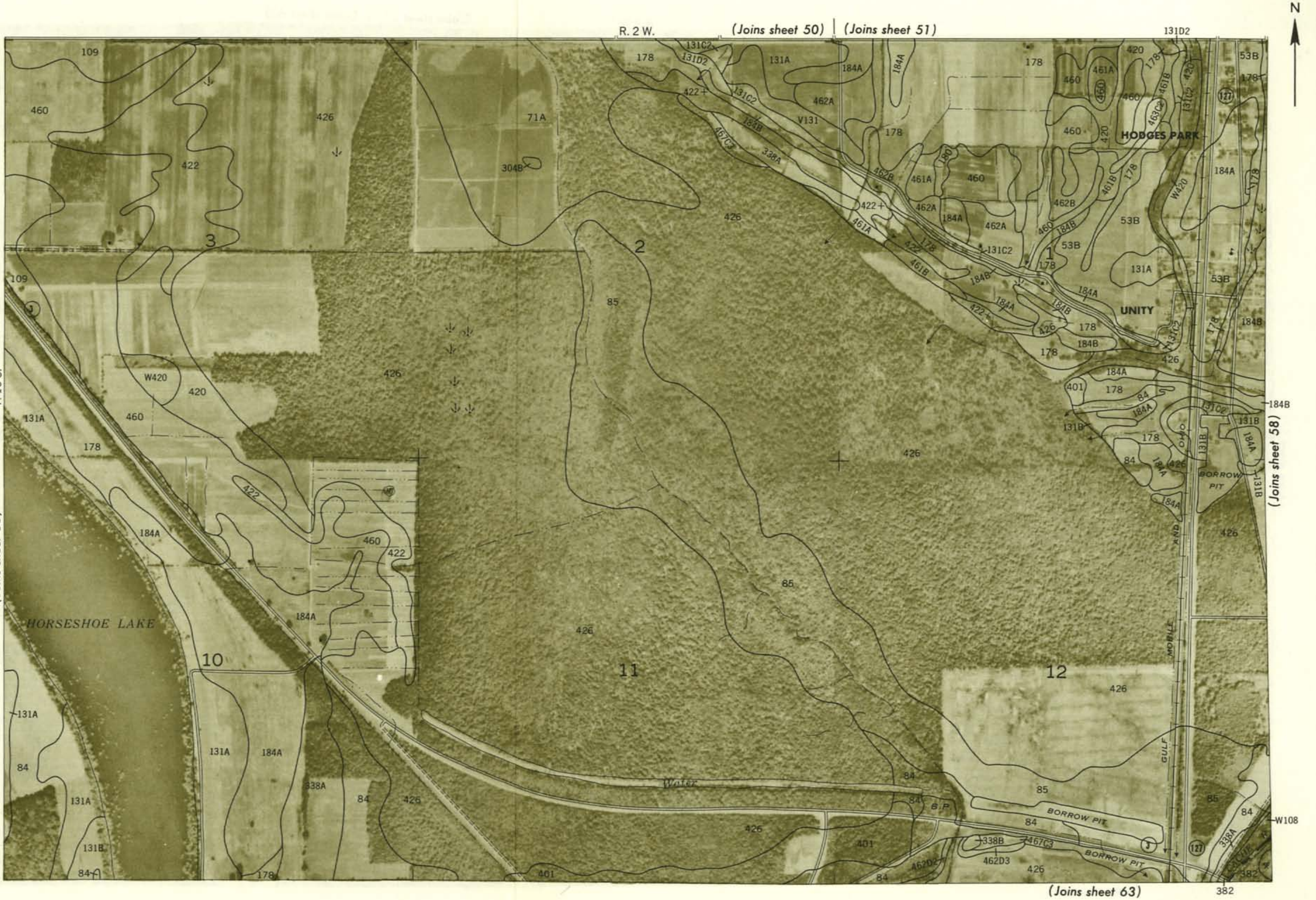

N
R. 1 W.
R. 1 E.
T. 15 S.
(Joins sheet 45)
(Joins sheet 52)
(Joins sheet 54)
(Joins sheet 59)
(Joins sheet 60)
INTERSTATE HIGHWAY 57
25
29
30
31
32
36

N


(Joins sheet 46)
(Joins sheet 53)
(Joins sheet 60)
(Joins inset, sheet 47)
R. 1 E.
T. 15 S.
OLMSTEAD
QUARRY
QUARRY
CENTRAL
NEW YORK
OHIO RIVER
KENTUCKY
BALLARD COUNTY
BORROW PIT
Bay Creek
Horse Creek
28
27
26
33
34
333
214C2
214D3
164B
165
382


N
R. 3 W.
(Joins sheet 48)
(Joins sheet 49)
T. 16 S.
(Joins sheet 56)
(Joins sheet 61)
MISSISSIPPI RIVER
SCOTT COUNTY
MISSOURI
BURNHAM ISLAND
Santa Fe Chute
MISSOURI PACIFIC
SURVEY NO. 526
SURVEY NO. 525
SURVEY NO. 527
SURVEY NO. 528
1
2
3
10
11
12

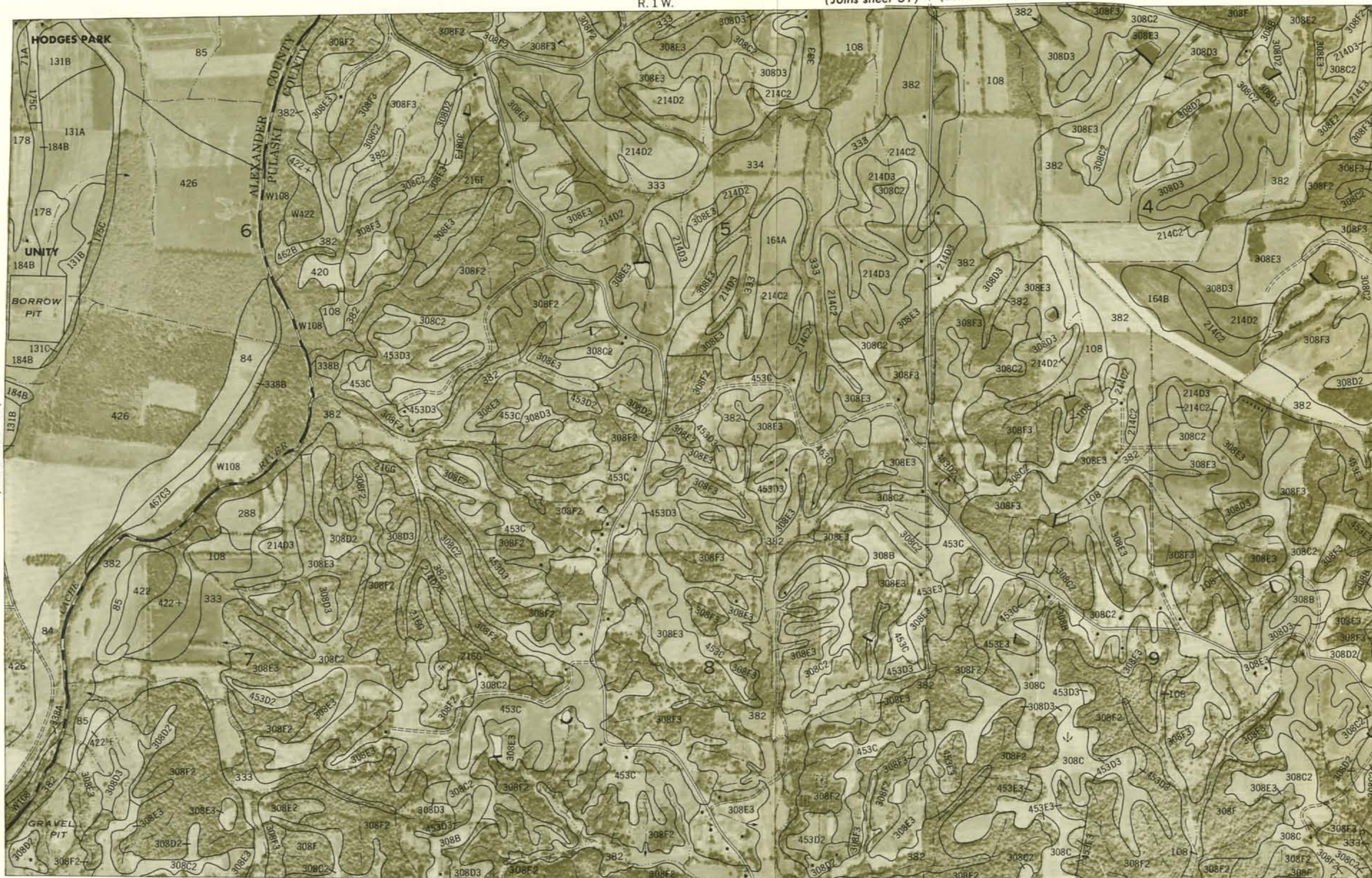

N
R. 2 W.
(Joins sheet 49)
(Joins sheet 50)
(Joins sheet 55)
(Joins sheet 57)
(Joins sheet 62)
T. 16 S.
H O R S E S H O E L A K E
4
5
6
7
8
9


N
R. 2 W.
(Joins sheet 50)
(Joins sheet 51)
(Joins sheet 56)
(Joins sheet 58)
(Joins sheet 63)
T. 16 S.
HODGES PARK
UNITY
HORSESHOE LAKE
BORROW PIT
MOBILE AND OHIO
GULF
Water
1
2
3
10
11
12

N

R. 1 W.

(Joins sheet 51) | (Joins sheet 52)

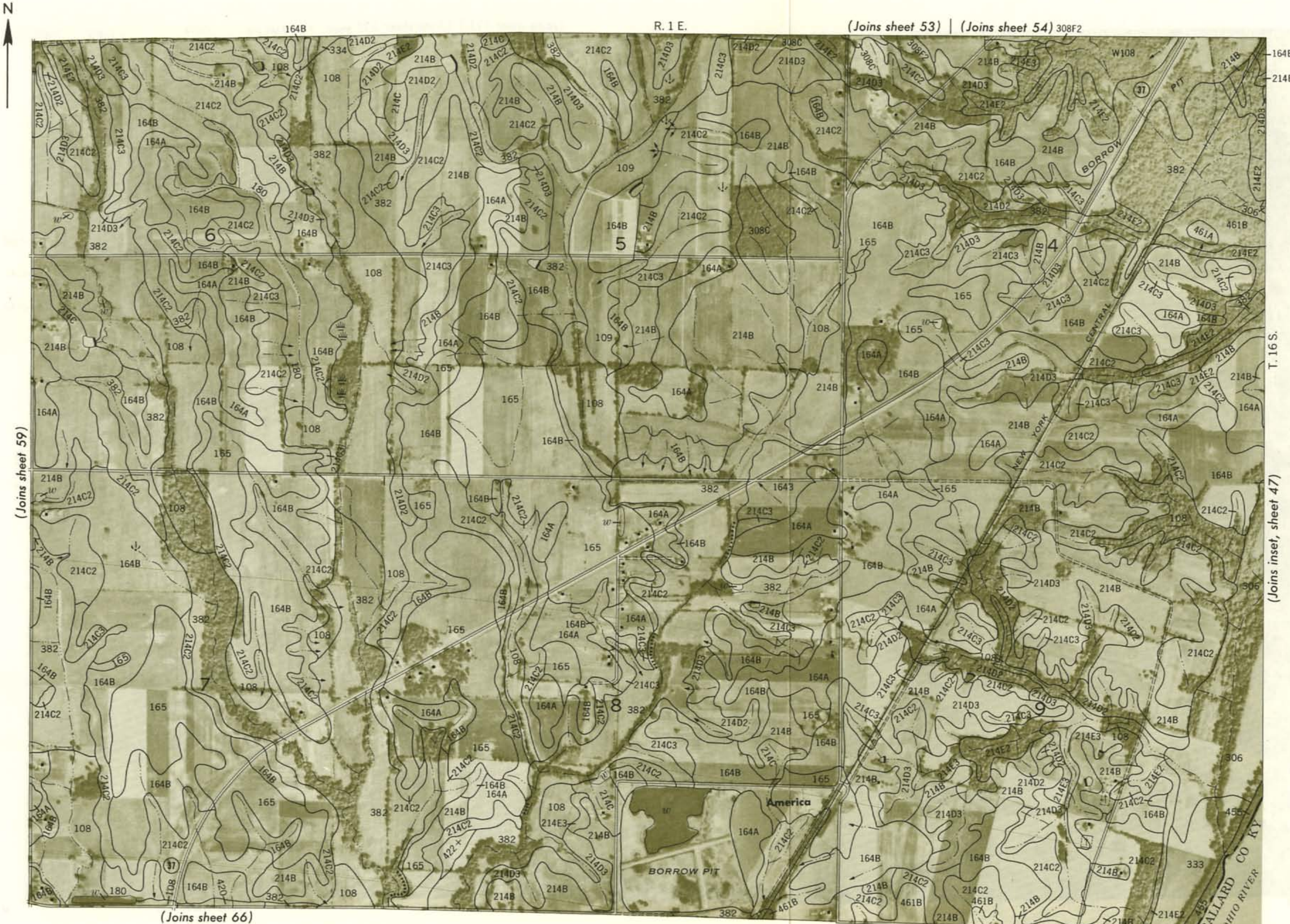


(Joins sheet 57)

(Joins sheet 59)

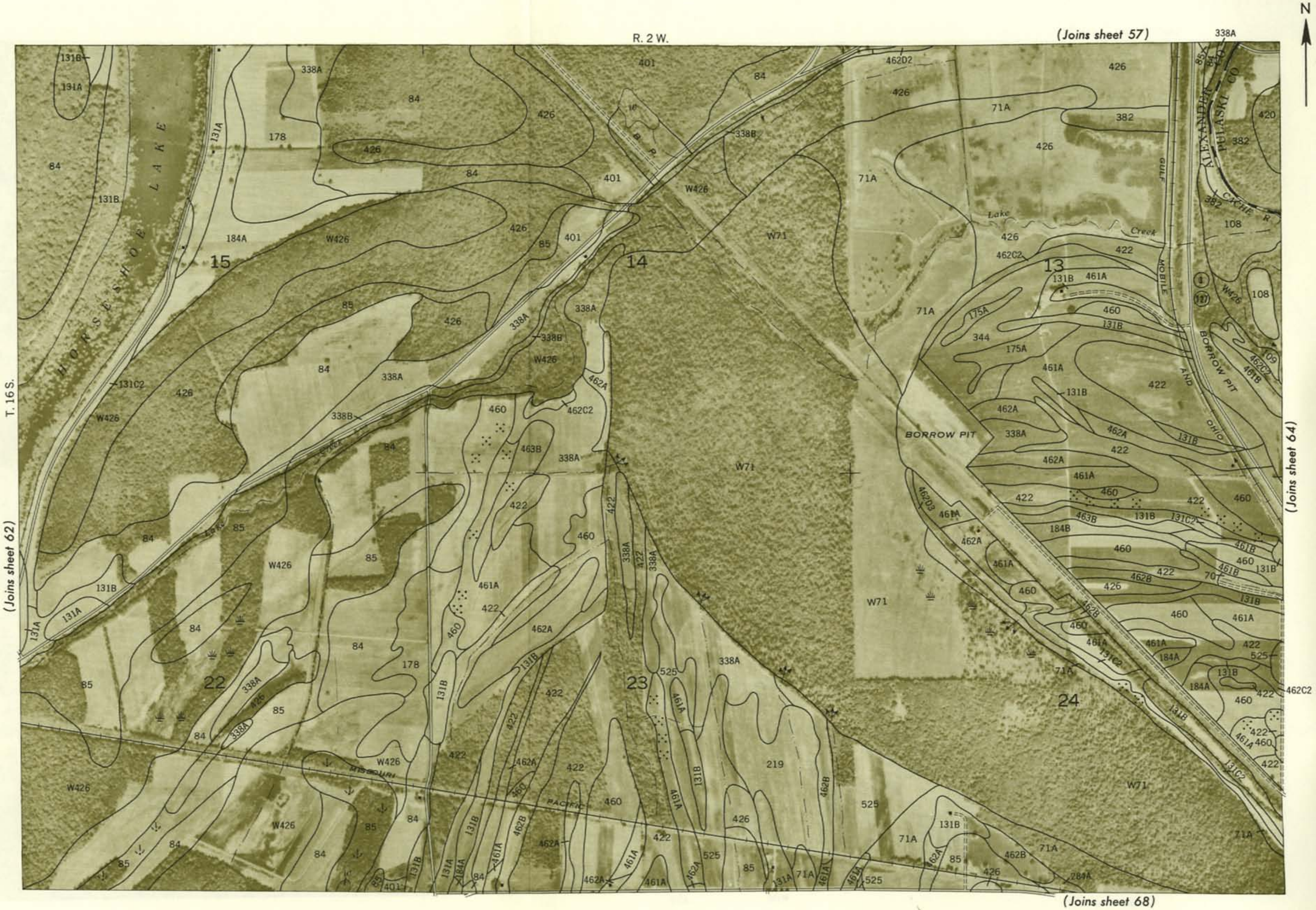
(Joins sheet 64)

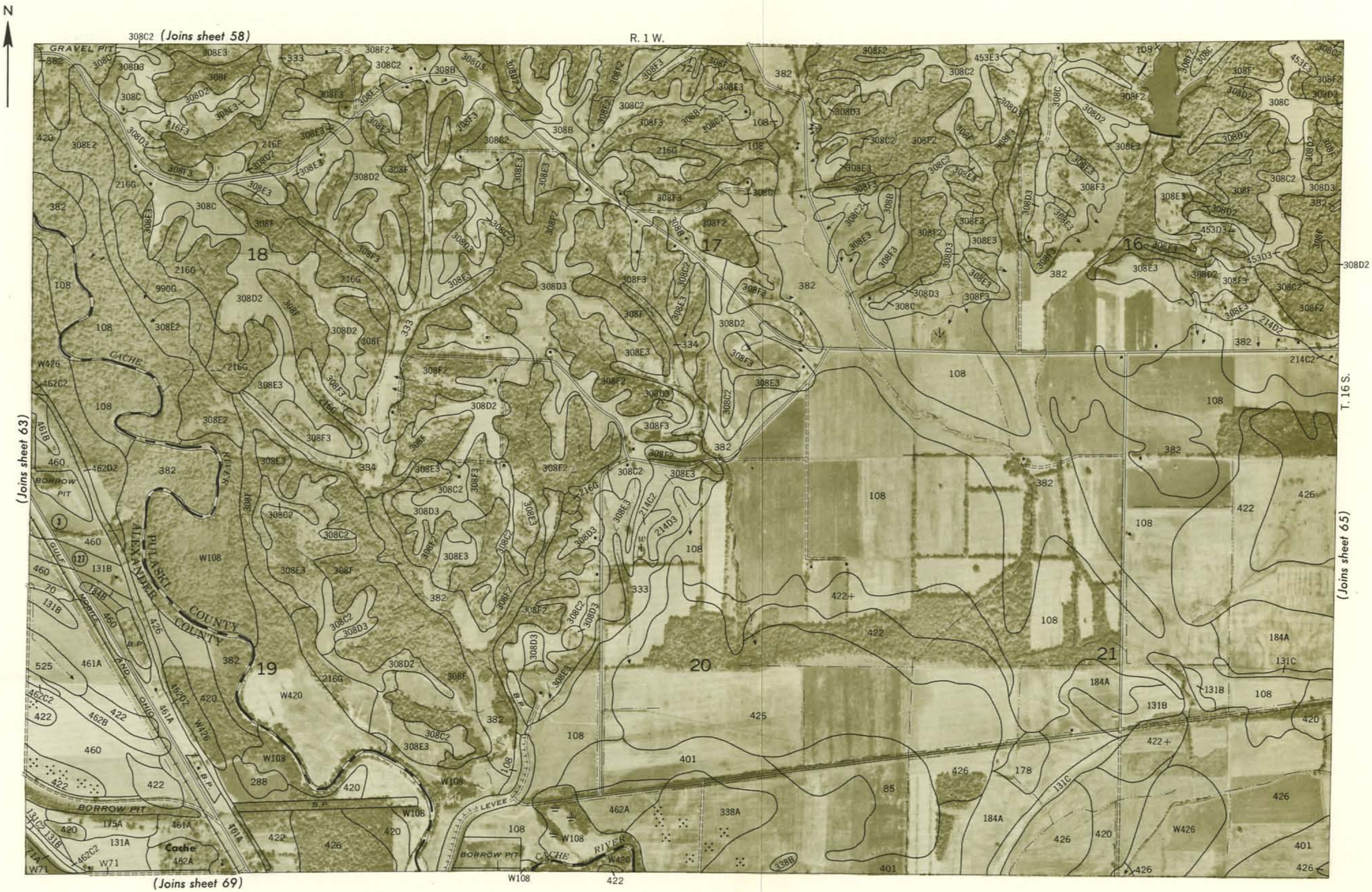

N
R. 1 W.
(Joins sheet 52)
(Joins sheet 53)
VILLA RIDGE
51
CEMETERY
ILLINOIS CENTRAL
INTERSTATE HIGHWAY
PROPOSED ROUTE
T. 16 S.
(Joins sheet 58)
(Joins sheet 60)
(Joins sheet 65)
Interchange

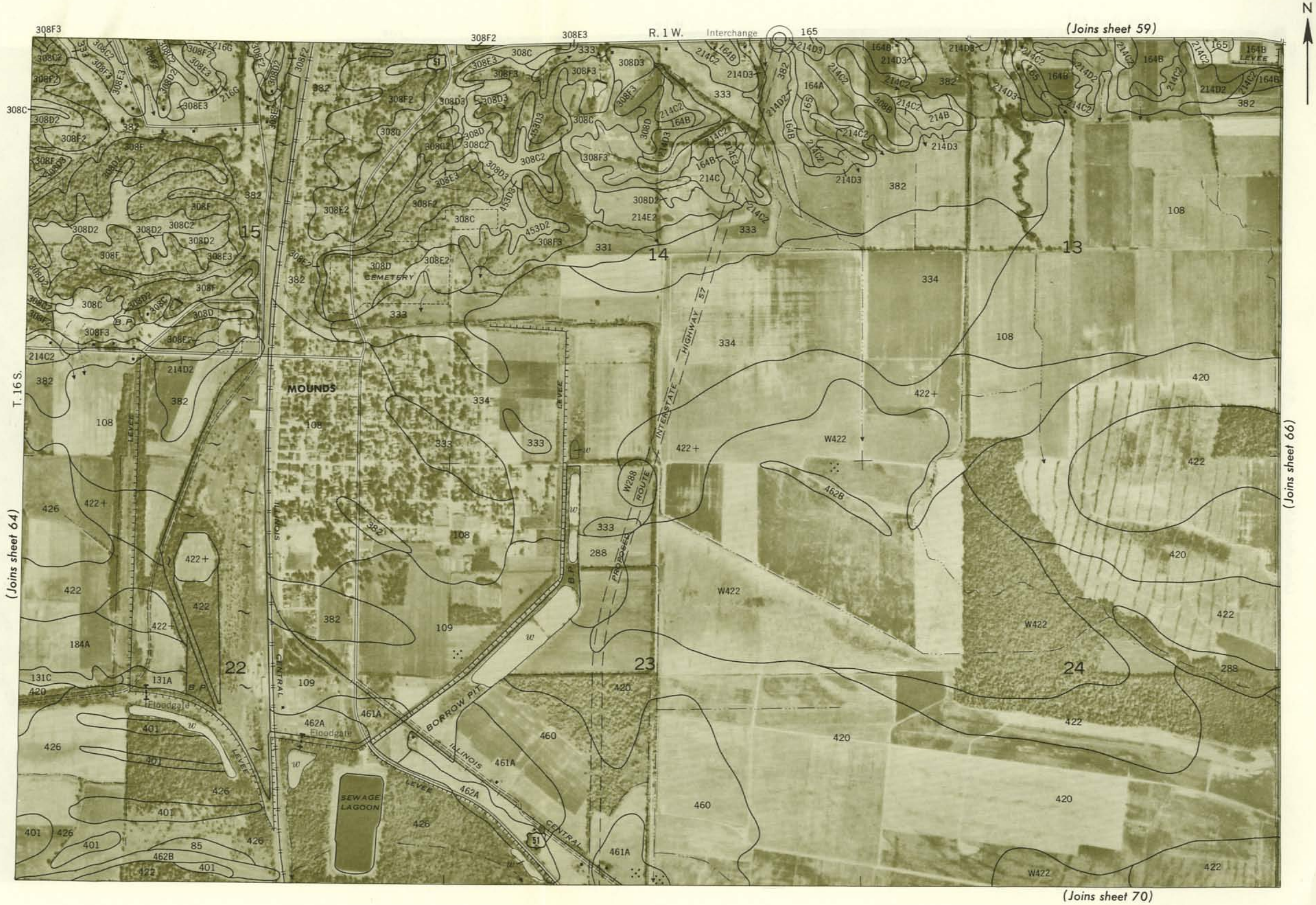

N
R. 1 E.
(Joins sheet 53) | (Joins sheet 54)
(Joins sheet 59)
(Joins inset, sheet 47)
(Joins sheet 66)
T. 16 S.
BORROW PIT
NEW YORK CENTRAL
America
BORROW PIT
BALLARD CO KY
OHIO RIVER


N
R. 3 W.
(Joins sheet 55)
(Joins sheet 62)
T. 16 S.
BURNHAM ISLAND
14
13
24
MISSISSIPPI
MISSOURI RIVER
Santa Fe Chute
SCOTT COUNTY MISSOURI
455
426
344
W426
131A
288
70
284A
162B
426
71A
180
590A
131B
304B
456A
456B
452A
452B
71C
530B


N
(Joins sheet 56)
R. 2 W.
T. 16 S.
(Joins sheet 61)
(Joins sheet 63)
(Joins sheet 67)
Tankville
Miller City
HORSESHOE LAKE
HORSESHOE LAKE
MISS RIVER
MISSOURI PACIFIC
SURVEY NO 528
SURVEY NO 664
16
17
18
19
20
21


N
R. 2 W.
(Joins sheet 57)
T. 16 S.
(Joins sheet 62)
(Joins sheet 64)
(Joins sheet 68)
HORSESHOE LAKE
BORROW PIT
Lake Creek
GULF MOBILE AND OHIO
BORROW PIT
MISSOURI PACIFIC
ALEXANDER PULASKI CO.
CACHE R.
15
14
13
22
23
24

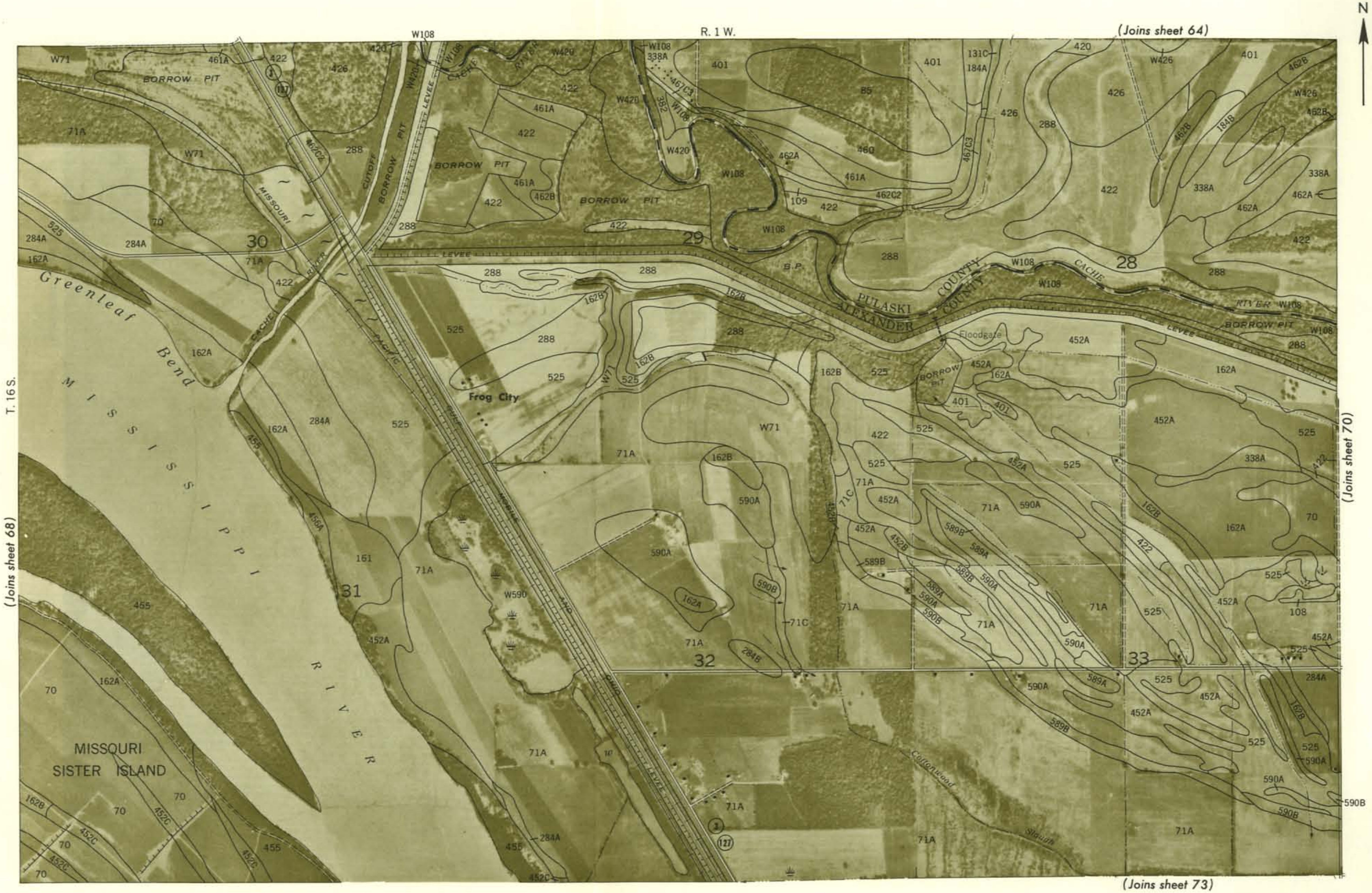

N
(Joins sheet 58)
R. 1 W.
GRAVEL PIT
(Joins sheet 63)
(Joins sheet 65)
T. 16 S.
(Joins sheet 69)
CACHE RIVER
ALEXANDER COUNTY
PULASKI COUNTY
GULF MOBILE AND OHIO
BORROW PIT
LEVEE
Cache
18
17
16
19
20
21


N
R. 1 W.
Interchange
(Joins sheet 59)
T. 16 S.
(Joins sheet 64)
(Joins sheet 66)
(Joins sheet 70)
MOUNDS
CEMETERY
SEWAGE LAGOON
BORROW PIT
Floodgate
LEVEE
ILLINOIS CENTRAL
INTERSTATE HIGHWAY 57
PROPOSED ROUTE
15
14
13
22
23
24


N
(Joins sheet 60)
R. 1 E.
T. 16 S.
(Joins sheet 65)
(Joins inset, sheet 74)
LEVEE
BORROW PIT
Floodgate
NEW YORK CENTRAL
Bayou
KENTUCKY
BALLARD COUNTY
OHIO RIVER
16
17
18
19
20
21
108
214B
214C2
214D2
214D3
214F3
284
288
306
331
333
334
382
420
422
455
460
461A
461B
462C2
462C3
462D3
W288
W420
W422


N
R. 2 W.
(Joins sheet 62)
T. 16 S.
(Joins sheet 68)
(Joins sheet 71)
MISSISSIPPI RIVER
SCOTT COUNTY
MISSOURI
LEVEE
SURVEY NO. 529
SURVEY NO. 684
Willard
CEMETERY
28
29
30
31
32
33
455


N
(Joins sheet 63)
R. 2 W.
(Joins sheet 67)
(Joins sheet 69)
(Joins sheet 72)
T. 16 S.
MISSOURI PACIFIC
Roth
Water
Grand Lake
Greenleaf Bend
RIVER
MISSISSIPPI
Thompson Towhead
MISSOURI SISTER ISLAND
25
26
27
34
35
36


N
R. 1 W.
(Joins sheet 64)
(Joins sheet 68)
(Joins sheet 70)
(Joins sheet 73)
T. 16 S.
BORROW PIT
CUTOFF
BORROW PIT
LEVEE
CACHE RIVER
MISSOURI
CACHE
Greenleaf Bend
MISSISSIPPI RIVER
MISSOURI
SISTER ISLAND
Frog City
PULASKI COUNTY
ALEXANDER COUNTY
Floodgate
RIVER
BORROW PIT
GULF MOBILE AND OHIO
PACIFIC
Cottonwood Slough
B.P.
30
29
28
31
32
33
W108
W71
W420
W426
W590
71A
71C
284A
284B
525
162A
162B
288
422
461A
462A
462B
462C2
467C3
426
401
420
460
131C
184A
184B
338A
382
109
85
108
452A
452C
455
456A
161
70
590A
590B
589A
589B

N

(Joins sheet 65)

R. 1 W.

T. 16 S.

(Joins sheet 69)

(Joins inset, sheet 74)

(Joins sheet 74)

N

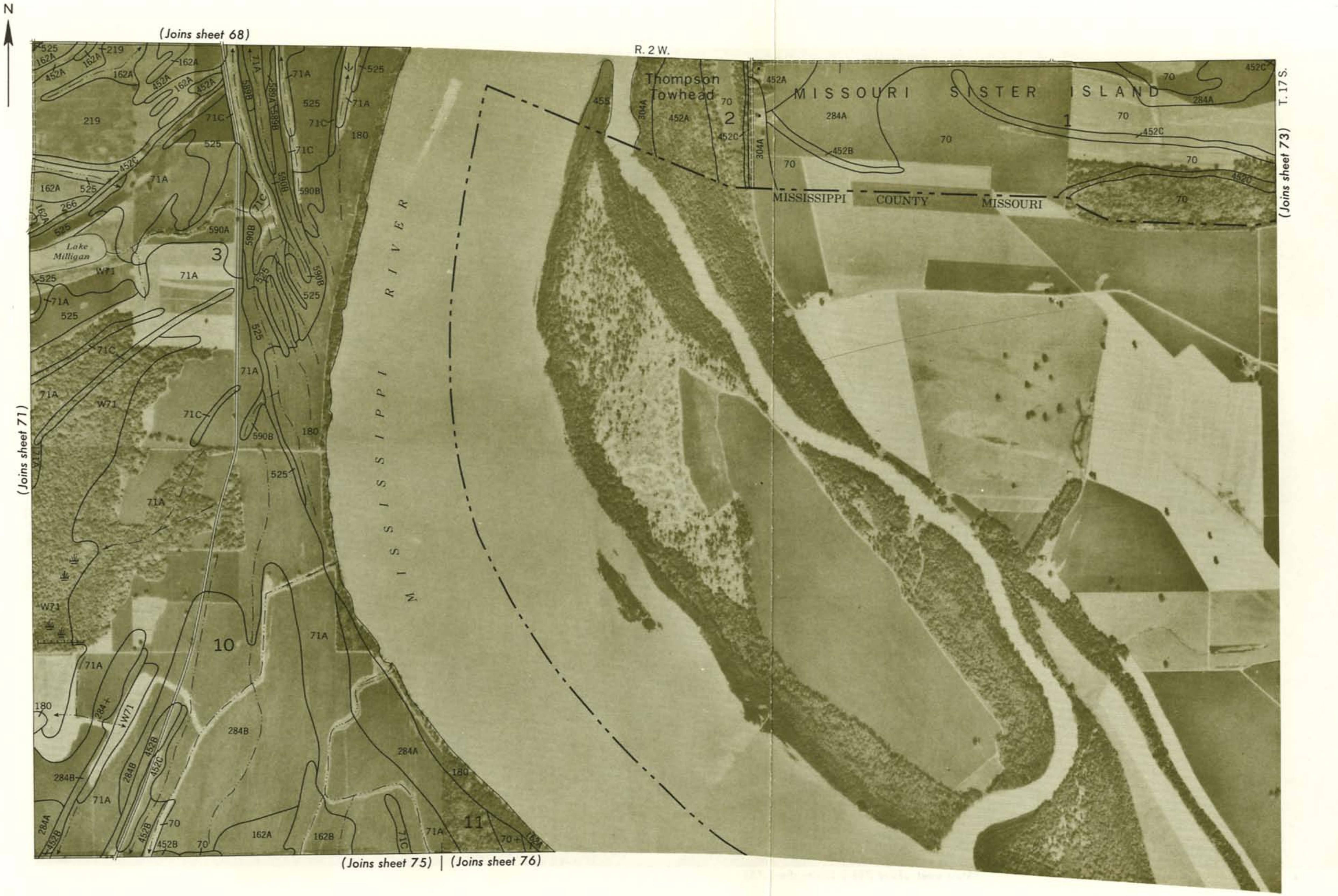
R. 2 W.

(Joins sheet 67)

T. 17 S.

(Joins sheet 72)

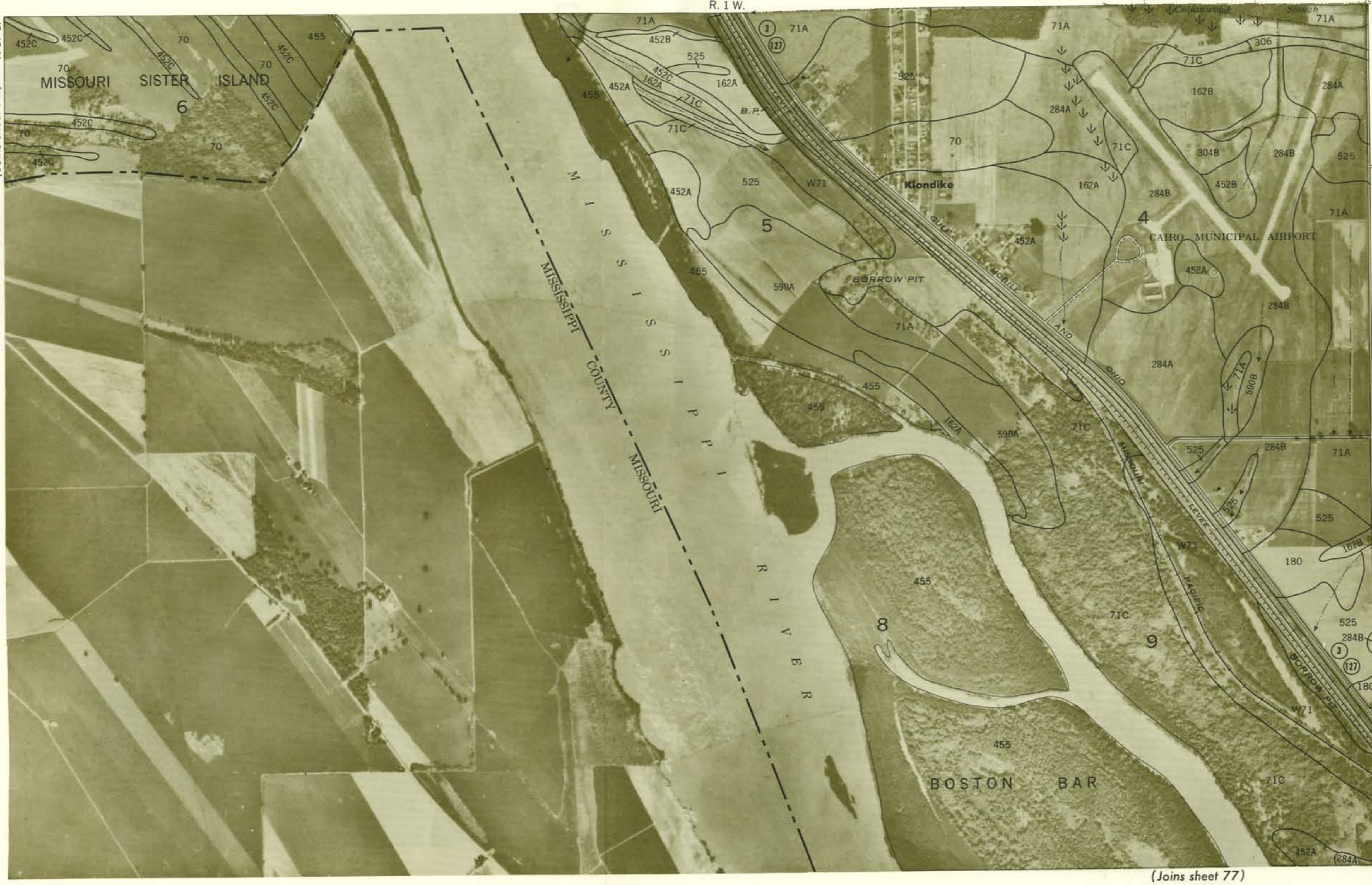
(Joins inset, sheet 75) | (Joins sheet 75)


N
(Joins sheet 68)
R. 2 W.
T. 17 S.
(Joins sheet 73)
(Joins sheet 71)
(Joins sheet 75)
(Joins sheet 76)
MISSISSIPPI RIVER
Thompson Towhead
MISSOURI SISTER ISLAND
MISSISSIPPI COUNTY MISSOURI
Lake Milligan

N

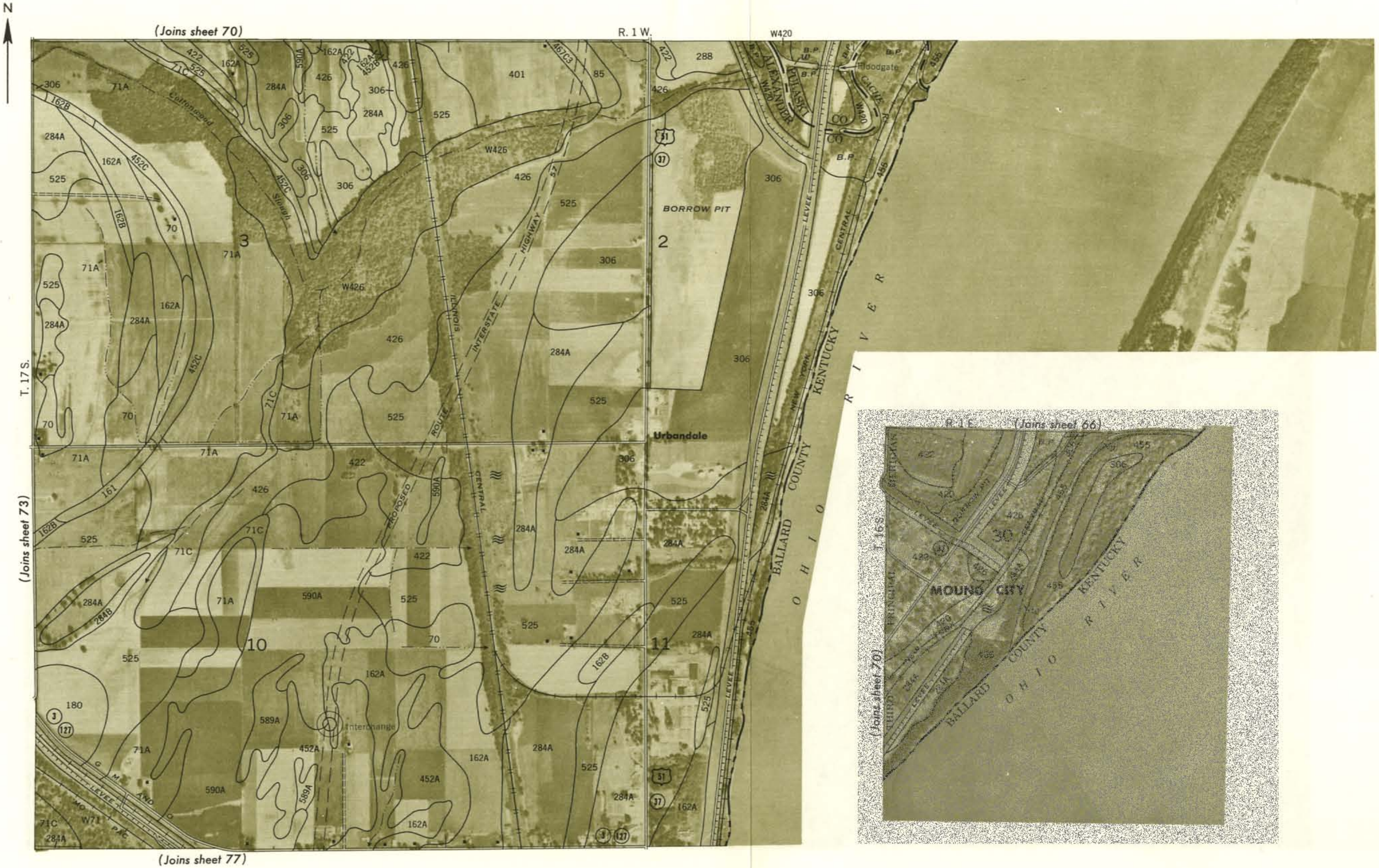
(Joins sheet 69)

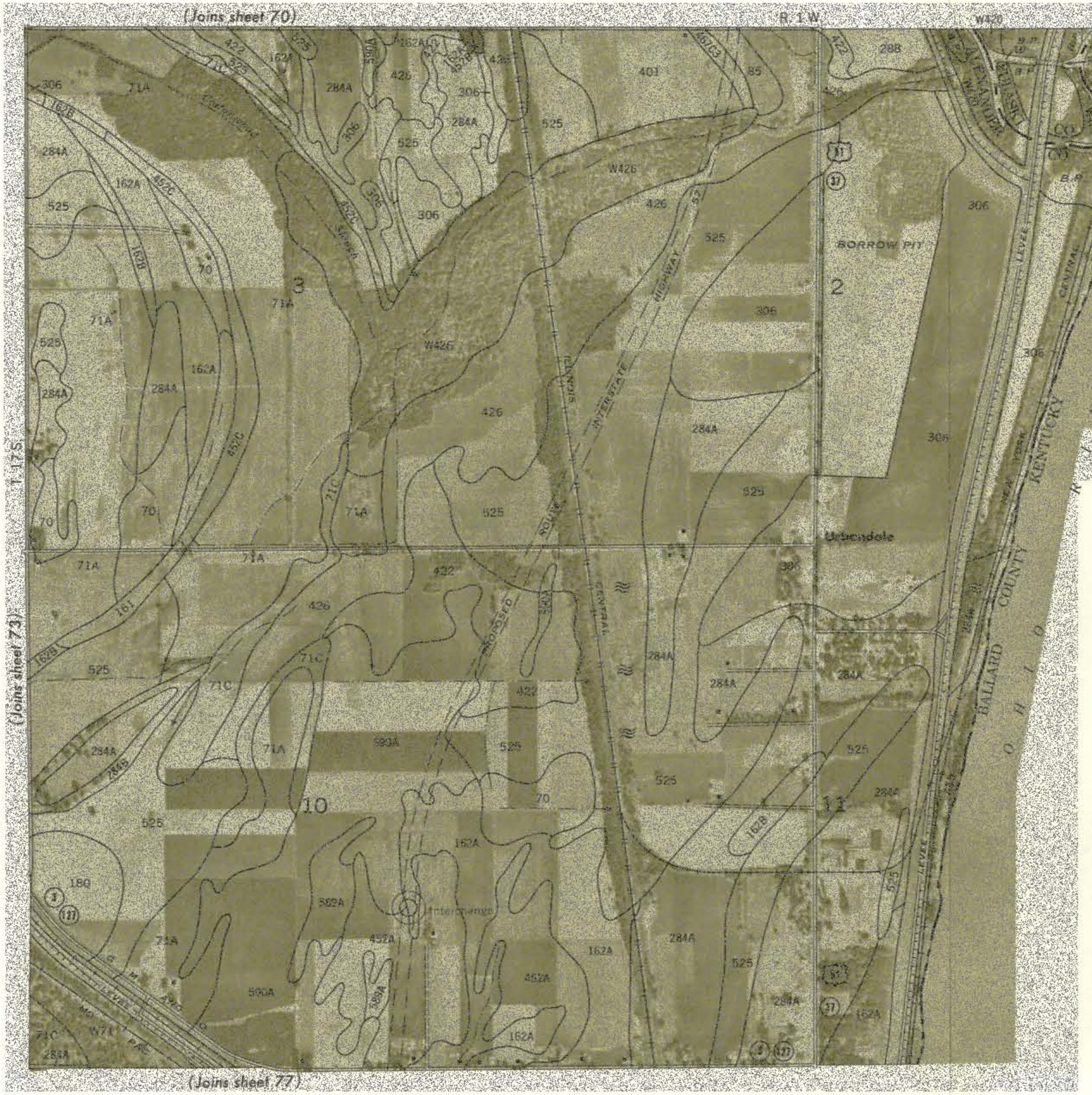
(Joins sheet 72)

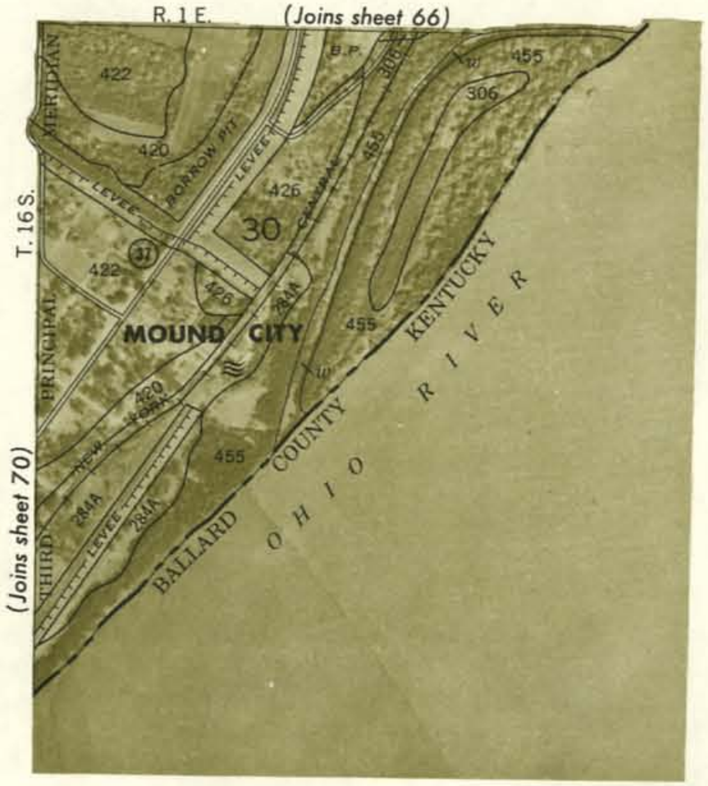


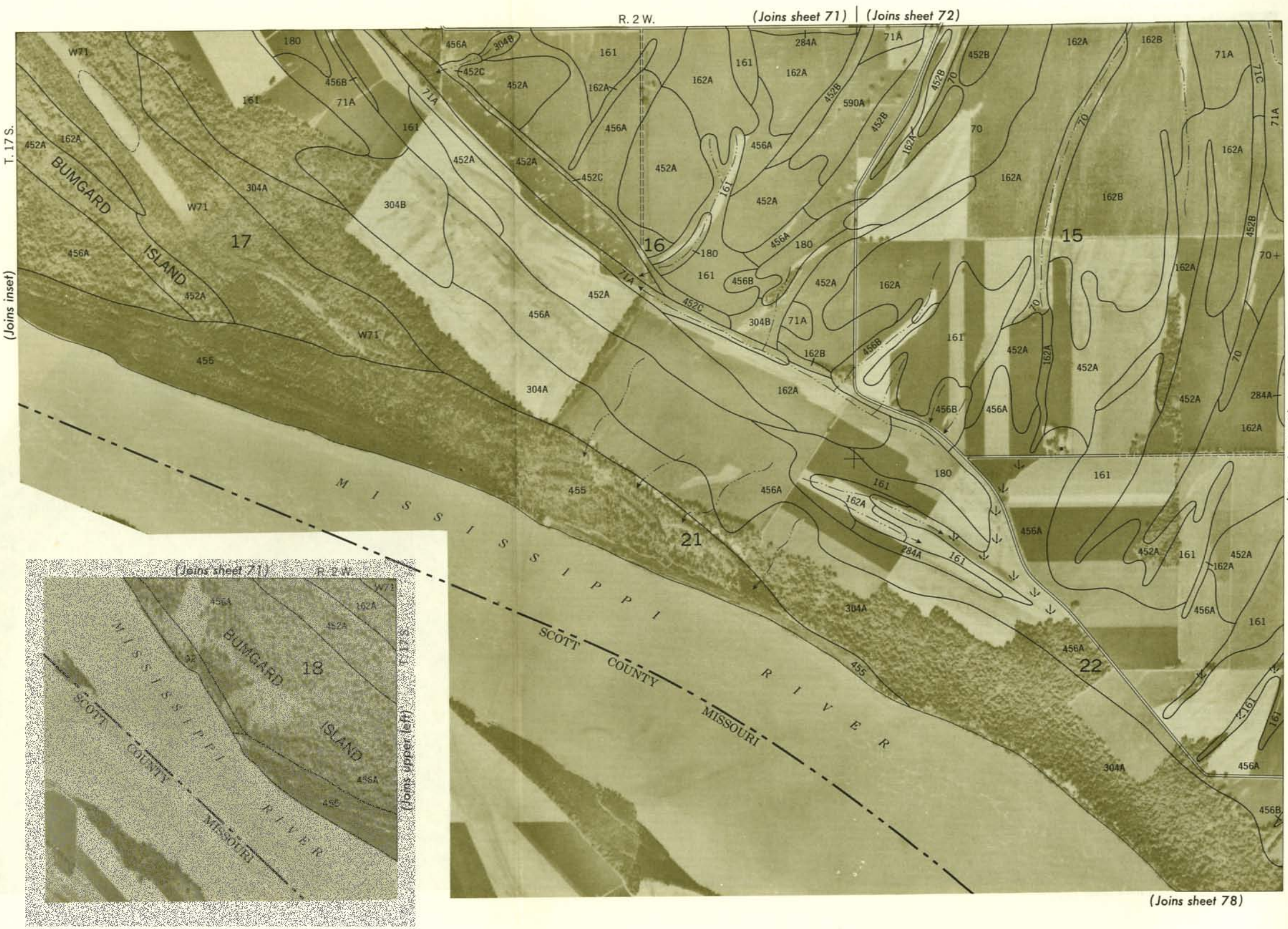
(Joins sheet 74)

(Joins sheet 77)

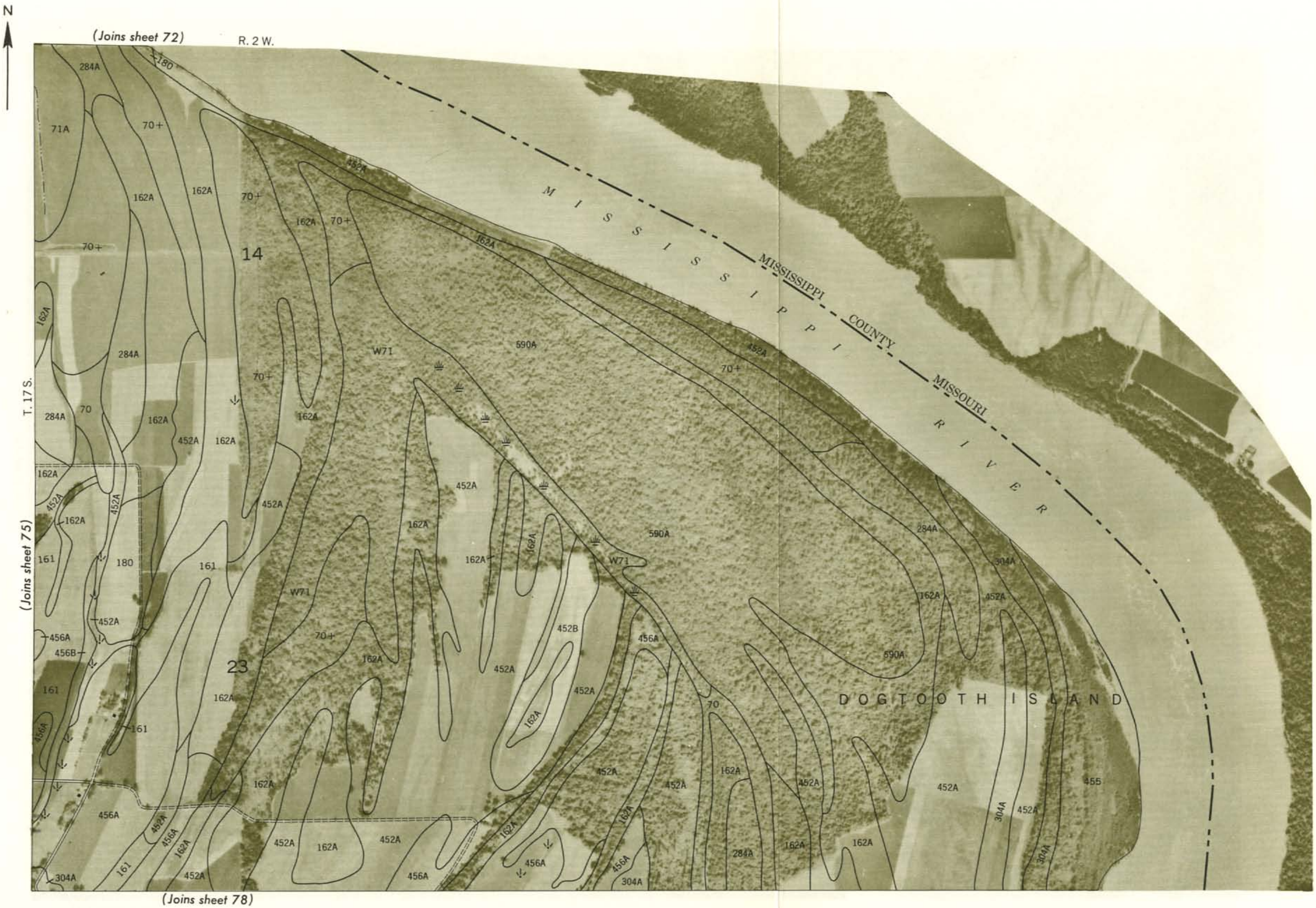

N
(Joins sheet 70)
R. 1 W.
T. 17 S.
(Joins sheet 73)
(Joins sheet 77)
BORROW PIT
Urbandale
Floodgate
Interchange
LEVEE
NEW YORK CENTRAL
KENTUCKY
BALLARD COUNTY
OHIO RIVER
INTERSTATE HIGHWAY 57
ILLINOIS CENTRAL
PROPOSED ROUTE
Cottonwood Slough
R. 1 E.
(Joins sheet 66)
T. 16 S.
(Joins sheet 70)
MOUND CITY


N
(Joins sheet 70)
R. 1 W.
(Joins sheet 73)
(Joins sheet 77)
T. 17 S.
BORROW PIT
Urbandale
BALLARD COUNTY KENTUCKY
OHIO RIVER
INTERSTATE HIGHWAY 57
ILLINOIS CENTRAL
NEW YORK CENTRAL
LEVEE
Interchange


R. 1 E.
(Joins sheet 66)
(Joins sheet 70)
T. 16 S.
THIRD PRINCIPAL MERIDIAN
MOUND CITY
BORROW PIT
LEVEE
30
BALLARD COUNTY KENTUCKY
OHIO RIVER

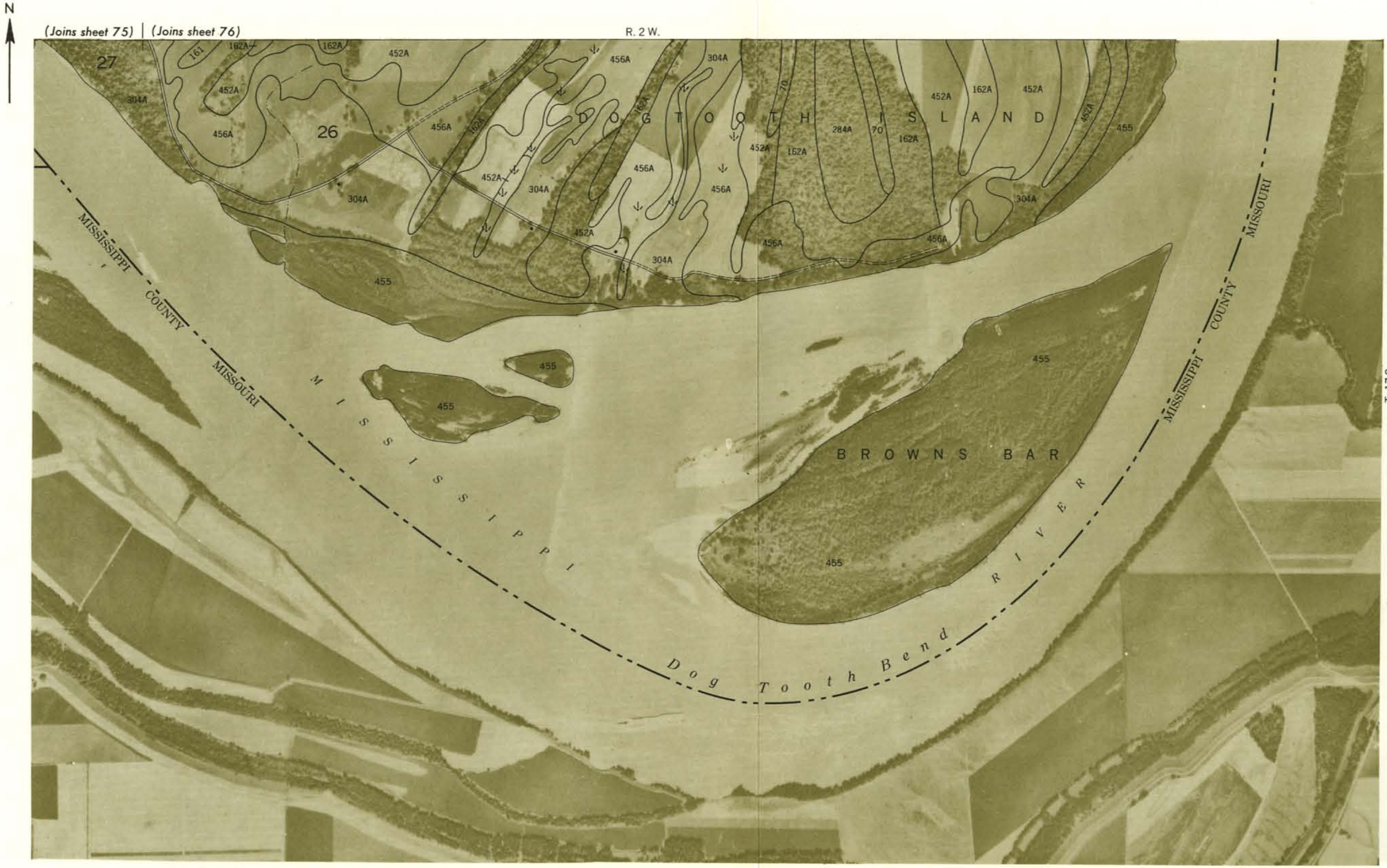

N
R. 2 W.
(Joins sheet 71)
(Joins sheet 72)
T. 17 S.
(Joins inset)
(Joins sheet 76)
(Joins sheet 78)
BUMGARD ISLAND
MISSISSIPPI RIVER
SCOTT COUNTY
MISSOURI
17
16
15
21
22
W71
180
456A
304B
452C
456B
71A
161
452A
162A
284A
590A
452B
70
162B
71C
304A
455
180
70+
(Joins sheet 71)
R. 2 W.
BUMGARD ISLAND
18
MISSISSIPPI RIVER
SCOTT COUNTY
MISSOURI
T. 17 S.
(Joins upper left)


N
(Joins sheet 71)
(Joins sheet 72)
R. 2 W.
T. 17 S.
(Joins inset)
(Joins sheet 76)
(Joins sheet 78)
BUMGARD
ISLAND
17
16
15
21
22
MISSISSIPPI
RIVER
SCOTT
COUNTY
MISSOURI
W71
161
162A
452A
304A
304B
456A
455
71A
452C
180
284A
452B
162B
590A
70
456B
(Joins sheet 71)
R. 2 W.
T. 17 S.
(Joins upper left)
18
456A
162A
452A
92
455
W71


N
(Joins sheet 72)
R. 2 W.
T. 17 S.
(Joins sheet 75)
(Joins sheet 78)
MISSISSIPPI RIVER
MISSISSIPPI COUNTY
MISSOURI
DOGTOOTH ISLAND
14
23
284A
71A
70+
162A
590A
W71
452A
452B
161
180
456A
456B
304A
455
70

(Joins sheet 73) (Joins sheet 74)

(Joins sheet 79)

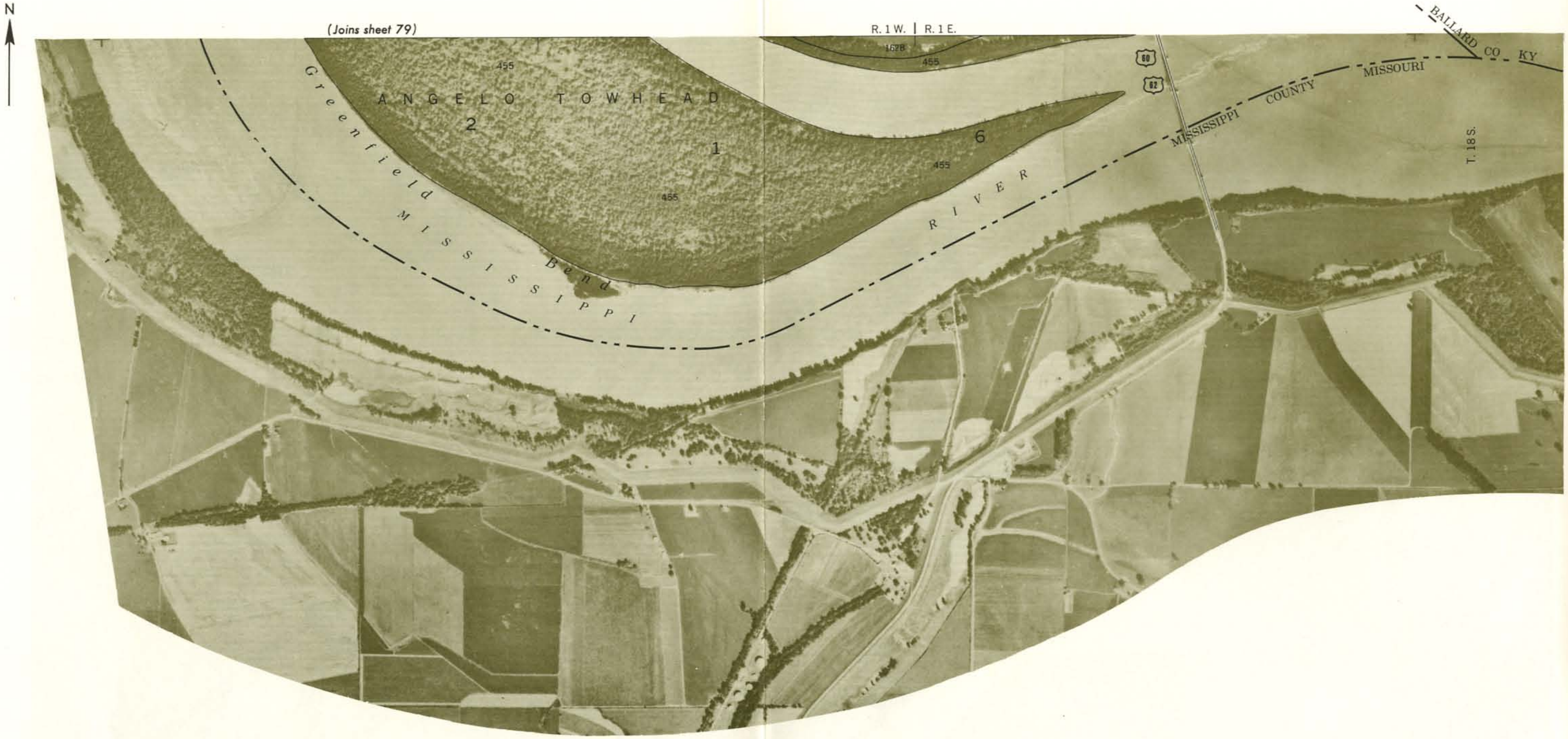

N
(Joins sheet 75)
(Joins sheet 76)
R. 2 W.
T. 17 S.
27
26
D O G T O O T H I S L A N D
B R O W N S B A R
M I S S I S S I P P I
R I V E R
Dog Tooth Bend
MISSISSIPPI COUNTY MISSOURI
MISSOURI COUNTY MISSISSIPPI
161
162A
452A
456A
304A
284A
70
455

N

(Joins sheet 77)

R. 1 W. | R. 1 E.

(Joins sheet 80)


N
(Joins sheet 79)
R. 1 W.
R. 1 E.
BALLARD CO KY
MISSOURI
MISSISSIPPI COUNTY
T. 18 S.
ANGELO TOWHEAD
Greenfield Bend
MISSISSIPPI RIVER
60
62
1628
455
2
1
6